THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
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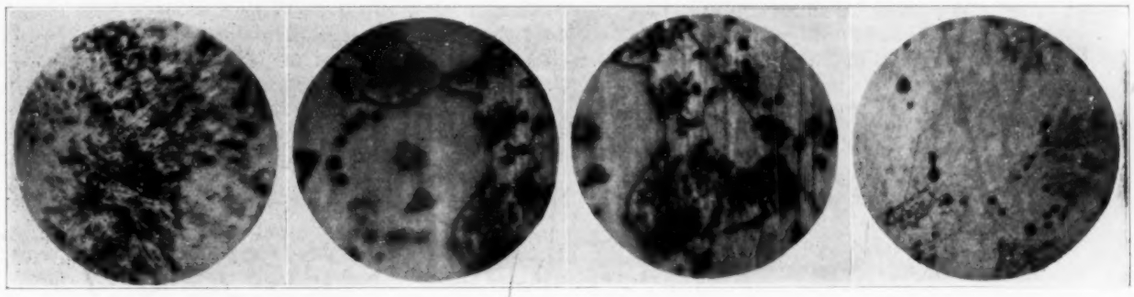
NOTES ON COPPER

By Wirt Tassin.*

(Concluded from August.)

EFFECTS OF OTHER ELEMENTS ON COPPER.

Antimony unites with copper to form antimonides, and when sulphur is present sulphantimonides. In both of these classes of compounds the antimony may be replaced in part by arsenic, and the copper by iron, lead, nickel, etc. The general effect of antimony on the physical properties of copper is to increase hardness, lower the conductivity and increase shortness. With 0.50 per cent. red shortness is frequently set up, and when 1.00 per cent. is reached, the metal is very red short. Antimony is the preponderating impurity in certain electrolytic coppers, and is then decidedly injurious. The effect of varying amounts of antimony on the structures of copper is shown in micrographs 24, 25 and 26.

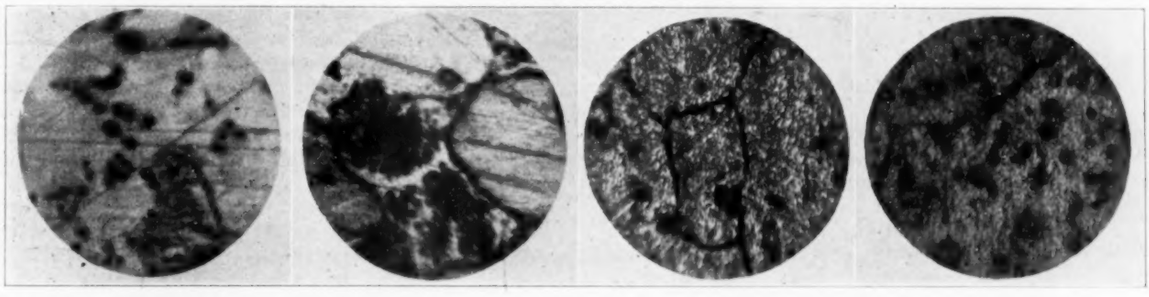


FIGS. 24, 25 and 26. Copper with antimony.

FIG. 27. Copper with arsenic.

Arsenic unites with copper to form a series of compounds, analogous to those with antimony. Small amounts reduce the tendency to porosity, and aid in nullifying the effects of bismuth. It lowers the conductivity and increases hardness, strength and durability. For certain uses 0.50 per cent. not only produces no ill effects, but where resistance to high temperatures together with tenacity, strength, ductility and durability are required, as in firebox plates, locomotive tubes, etc., it is decidedly beneficial. When present, even above 1.00 per cent., there is no cold shortness, and only a slight red shortness. Arsenic is often present in Lake copper, and its presence may be a cause for the high reputation of the metal.

Micrographs 27, 28 and 29 show the influence of varying amounts of arsenic on the structure of copper. Comparing these structures with those of the antimonial coppers, it will be noted that they are almost identical, and that they afford no explanation of why arsenic may be a benefit and antimony a detriment to copper. The reason is probably to be found in its nullifying effects on other impurities, such as are often present in, say, Bessemerized copper.



FIGS. 28 and 29. Copper with arsenic.

FIG. 30. Copper with sulphur.

FIG. 31. Copper with sulphur absorbed in annealing.

Sulphur makes copper cold short, and with 0.20 per cent. the metal is unworkable. It has a marked influence on conductivity and 0.2 per cent. lowers the conductivity, 10 per cent. Sulphur has a great affinity

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for copper, and unites with it to form sulphides which both surround and penetrate the grain (Fig. 30). The presence of sulphur gases in the annealing furnace, especially in the presence of reducing gases, is decidedly injurious, as the copper will take up sulphur to form sulphides, which penetrate the surface of the metal more or less deeply (Fig. 31), pitting it, and making it weak and brittle.

Iron has a marked effect on the conductivity of copper, and 0.40 per cent. will lower the conductivity of pure copper from 100 to 36. A small amount has no effect on the toughness of the metal, and may increase its strength. With any great amount present, it produces cold and hot shortness. Iron dissolves in the copper, and up to 0.15 per cent. has no effect on the structure (Fig. 32). As the percentage of iron increases it forms an alloy containing 4 per cent. of copper, which separates in nodules (Fig. 33), and as the amount increases the iron itself separates in globules and stringers.

Lead, in the presence of much cuprous oxide, forms the compound 2CuO.PbO, and under certain conditions may improve the conductivity. This oxide apparently is not injurious so far as the other physical properties are concerned, even when present in amounts as high as 1.00 per cent. Lead does not alloy with copper except when bismuth or antimony is present, and under these conditions is sometimes added to copper to improve its rolling. In the absence of other metallic impurities, lead up to 0.15 per cent. does not affect the malleability of copper. With 0.30 per cent. it sets up cold shortness and is hot short with 0.45 per cent. The effect of 0.15 per cent. of lead on the microstructure is to develop the cubic structure of the crystals composing the grain and to increase their size (Fig. 34) and at the same time reduce the grain size. No free lead can be distinguished, and the metal is perhaps present entirely as 2CuO.PbO. With 0.30 per cent. globules of lead can be detected (Fig. 35).

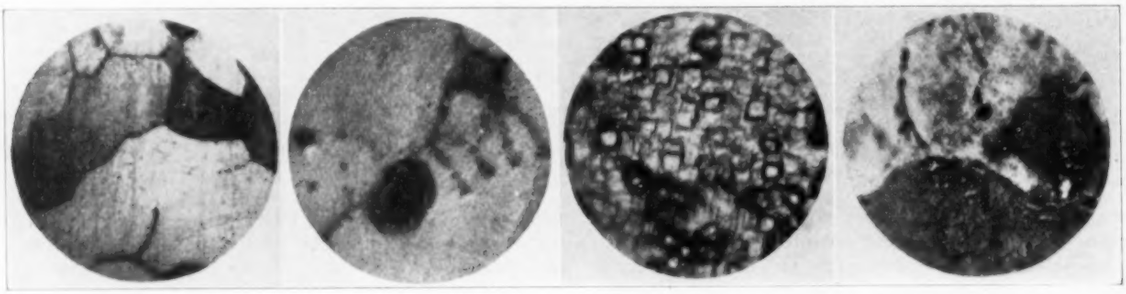

FIG. 32. Copper with 0.15% of iron.

FIG. 33. Copper with 4% of iron.

FIG. 34. Copper with .15% of lead.

FIG. 35. Copper with .30% of lead.

FOUNDRY TESTS AND FOUNDRY PRACTICE*

By W. R. Dean.†

W. R. DEAN.

With the advent of the chemical engineer into the brass founding industry and the use of more brass and bronze castings by the mechanical engineers, the foundryman of today has to look after the quality of his metal if he wishes to keep in the field. The foundry foreman has enough to do to look after his production while the chemical engineer looks after the development of the alloys, etc. In the last few years more thought has been given to the alloying and melting of metals and all up-to-date foundries keep in touch with some chemist or engineer. In large manufacturing plants, where a large amount of borings, etc., are made, it is almost impossible to keep the different metals separate, for instance, different kinds of composition turnings may be mixed up by the machine hand unintentionally and returned to the foundryman for him to use as best he can. By the aid of a chemist these could be melted and run into ingots and the chemical composition of the mass determined and used accordingly.

The man in charge of the chemical laboratory of a manufacturing plant should be a chemical engineer, and not merely a chemist, he should be able to make mechanical tests as well as chemical, be able to chart his results for future reference and to draw conclusions from them. A year or two of actual foundry practice will do him no harm and worlds of good. For often what looks good theoretically works out quite differently in actual practice. Take manganese bronze, for instance, you can weigh out two or more heats of this alloy very carefully and on testing have quite different results, due to different conditions in the working of the furnaces and furnace tenders, etc. Theoretically two or more tests of metal of the same composition from different pots should test alike, but they do not. Even in the case of Government bronze (88-10-2), tests of which I will speak later, will show different results even when chemical analysis shows the different castings to be the same in composition.

In manganese bronze the tests are controlled better by being sure that the pots of metal are practically of the same composition when poured. That is, that zinc is added to replace the zinc oxidized. To have two or more pots the same or to have one pot show the proper grain, at the plant with which I am connected, we carry out preliminary tests before pouring for routine control. This is done by breaking a "test" with a sledge. In weighing out the copper and zinc for manganese bronze

*Paper read at Buffalo Convention, American Institute of Metals, September, 1912.

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no matter how careful you are, the grain will often vary considerably, and the tests will also vary, for example:

	Tensile strength.	Elastic limit.	Elongation in 2 ins.
No. 1.....	73,000 lbs.	40,000 lbs.	26%
No. 2.....	76,000 lbs.	34,000 lbs.	24%
No. 3.....	69,000 lbs.	40,000 lbs.	25%
No. 4.....	80,000 lbs.	30,000 lbs.	20%

If preliminary tests are taken and the grain kept the same in all cases, as near as possible with the trained eye, the results of the test pieces will be nearer alike. For example, we poured two test pieces from a heat for four different days, breaking one from each heat and keeping the grain the same; the four saved were pulled and gave the following results:

	Tensile strength.	Elastic limit.	Elongation in 2 ins.
No. 1.....	72,000 lbs.	44,000 lbs.	26%
No. 2.....	72,200 lbs.	44,500 lbs.	25%
No. 3.....	73,000 lbs.	43,000 lbs.	25%
No. 4.....	72,000 lbs.	44,000 lbs.	27%

Of course a certain amount of oxidation takes place that is uncontrollable, which is shown by the slight variance, but, on the whole, it is better than the ones not tested.

In alloying a pot of bronze it is a good plan to leave out a small piece of zinc, say 2 or 3 pounds, until you have broken your test bar and noted the grain, for sometimes the grain is a little coarse if all the charge is put in at once, due to the scales or the man weighing not being accurate, or due to other causes. Nine out of ten times the grain will be all right, but the 10th time it will be a little under or a little over. Then it requires that either part or all of the zinc left out should be put in, or if overgrained a small piece of copper, and another test made. The leaving out of the piece of zinc is very beneficial when alloying two or more pots and trying for the same grain.

In alloying two or more pots no matter how careful you are in weighing, melting, etc., the grain of the different pots will differ considerably a good many times, and then the tests will show up this difference so the zinc can be added or not; depending on the grain wanted. It is easier to add zinc than to add copper. It is necessary while consuming the time in trying the tests to keep the pots well covered with charcoal so as not to oxidize, and it is well to throw in a handful of salt. This testing takes from 10 to 15 minutes, according to the number of tests necessary. Don't hurry the cooling of your tests by quenching in water too soon after pouring, and when you do quench do it carefully. That is, plunge it in and out quickly and let remain out a few minutes before putting it in again. In this way you will not alter the grain any. Sudden cooling makes the grain coarser.

Different specifications call for different grains; for instance, you might have a specification calling for 65,000 tensile strength, 40 per cent. of tensile strength for elastic limit and 25 per cent. elongation, or you might have 65,000 tensile strength—30,000 elastic limit and 20 per cent. elongation. The latter specification calls for lower elastic limit and elongation but the same tensile strength. For these Matthiessen and Hegeler spelter could be used and run a fairly coarse grain as our elongation is not high and that will ensure our tensile strength being right. For the first use a better spelter, as a higher elongation is called for. Matthiessen and Hegeler spelter might give this tensile strength a good many times, but it is uncertain, depending on the melter. The grain should not be too coarse, as the elongation must reach 25 per cent., which is fairly high. In making the preliminary tests the grain should be coarser than what we expect to get in our test price attached to the casting. It should just begin to show a large crystalline fracture to give about 20 per cent. elongation. This preliminary testing is necessary to keep to a standard fracture on account of zinc being so volatile.

If you are using a furnace where the zinc can volatilize easily, as the reverbatory or air furnace, or an open flame furnace, this testing is necessary to keep the grain where it belongs. Often when the melt is waiting for the mold, 2 or 3 pounds of zinc to the 100 pounds of metal is necessary to keep the grain where you wish it. If you are ready to pour when the right temperature is reached this addition is unnecessary. For our air furnace we leave out 2 slabs for a large heat (60 or 70 hundred pounds) and make a test. Sometimes the grain has been coarse enough with only one slab added and sometimes it has taken all and one or two pounds more to the hundred to get the required grain. For elongation of only 20 per cent. we run a coarser grain than for an elongation of 25 per cent.

In getting the grain for the preliminary test it must be coarser than what is wanted in the machine test. For 20 per cent. elongation we have the grain a little on the crystalline side, for in the test on the casting it comes finer and the test pulls all right. A little experimenting and testing will give you the grain you wish. When using scrap this testing gives an idea of the amount of zinc to use to get the proper grain. Some allowance must be given for the temperature when adding the zinc. If the melt is extra hot the amount of zinc can be a little more than otherwise to allow for zinc burning out. It is only in extreme cases that the melt should be extra hot. Sometimes we have had extra thin castings weighing several tons that have necessitated exceedingly hot metal.

When the temperature is right the tests will be approximately the same, no matter how far apart. We have had tests on 30 foot shafts test the same when they have each been on the extreme ends. When the metal was too hot for the shafts the test near the pouring gate was lower in tensile strength than the middle test by 3 to 5 thousand pounds, due to oxidation.

In handling composition different obstacles are met with. It is more of a case of molding practice than of alloying, although good melting is necessary. With the best of care in melting two tests side by side very considerably, while chemical analysis shows the mixture O. K. The difference in test is due no doubt to cooling conditions, a difference in the temper of the sand, etc. In the following results of tests of two 9-inch angle bypass valves quite a difference is noted. The molds were made the same, as nearly as one man could make them, and the metal given careful attention:

	Tensile strength.	Elastic limit.	Elongation in 2 ins.	Reduction in area.
No. 1 dry sand...	32,320 lbs.	18,650 lbs.	16%	1.04
No. 2, green sand.	43,470 lbs.	16,300 lbs.	33½%	.96
No. 3, dry sand..	33,720 lbs.	20,800 lbs.	15%	1.03
No. 4, green sand.	36,500 lbs.	18,850 lbs.	16½%	1.04

The green sand mold gave the highest tensile strength, but there was a variance in the elongation. The dry sand mold gives more even results, so one would conclude that the dampness of the sand in the green sand mold had an effect on the tests, probably one test was cooled much quicker than the other. The elongation of No. 2 is unusual, the only way I can account for it is that ideal conditions in heat of metal and temper of sand, etc., must have been reached at this point. A chemical analysis showed the mixture to be right with no segregation of tin.

These tests are a point for discussion. I should like to hear the ideas of others if they have ever had such a variance. The addition of a small amount of nickel, ¼ of one per cent. to ½ of one per cent. materially increases the strength, etc., of 88-10-2. Tests that have gone only 28-33,000, tensile strength on the same molds have gone 38 to 42,000 pounds, with the addition of nickel to the metal. The nickel is added with the copper. One of the necessary things to do to get successful tests in this metal is to add the mixture to the copper at the right temperature. If the copper is too hot good results cannot be had.

We have made condenser tops weighing 3,800 pounds out of 88-10-2 with the addition of nickel in the air furnace, putting the nickel in when the copper was nearly melted and adding the tin and zinc when the copper was at the proper heat and had a tensile strength of 52,000 pounds per square inch. For large casting to stand high water pressure the molds should be made out of coarse sand, some core compound that will not scale when being dried, the mold wet-blacked and dried. The pouring temperature has a lot to do with the high tests of any metal. I have mentioned the case of manganese bronze; in 88-10-2 mixture or in any composition the mold should be poured at the proper temperature. If the metal is too hot gases are absorbed from the mold and the metal cuts into the mold, and if too cold the tests are cold short. The pouring temperature for a mold is gained only by experience and judgment. By studying a casting and getting the metal at the right temperature to pour, it's the tensile strength, etc., has been raised considerably over hit or miss pouring.

THE UNITED BRASSFOUNDERS & ENGINEERS, LTD., HALIFAX (ENGLAND) BRANCH FOUNDRY

In the successful manufacturing of brass steam valves, of all descriptions, the foundry holds a very important position, perhaps the most important. It is in this department that the work is commenced and if castings are not turned out right there is trouble and confusion in the subsequent finishing operations. It is owing to the successful and proper working of their brass foundries that

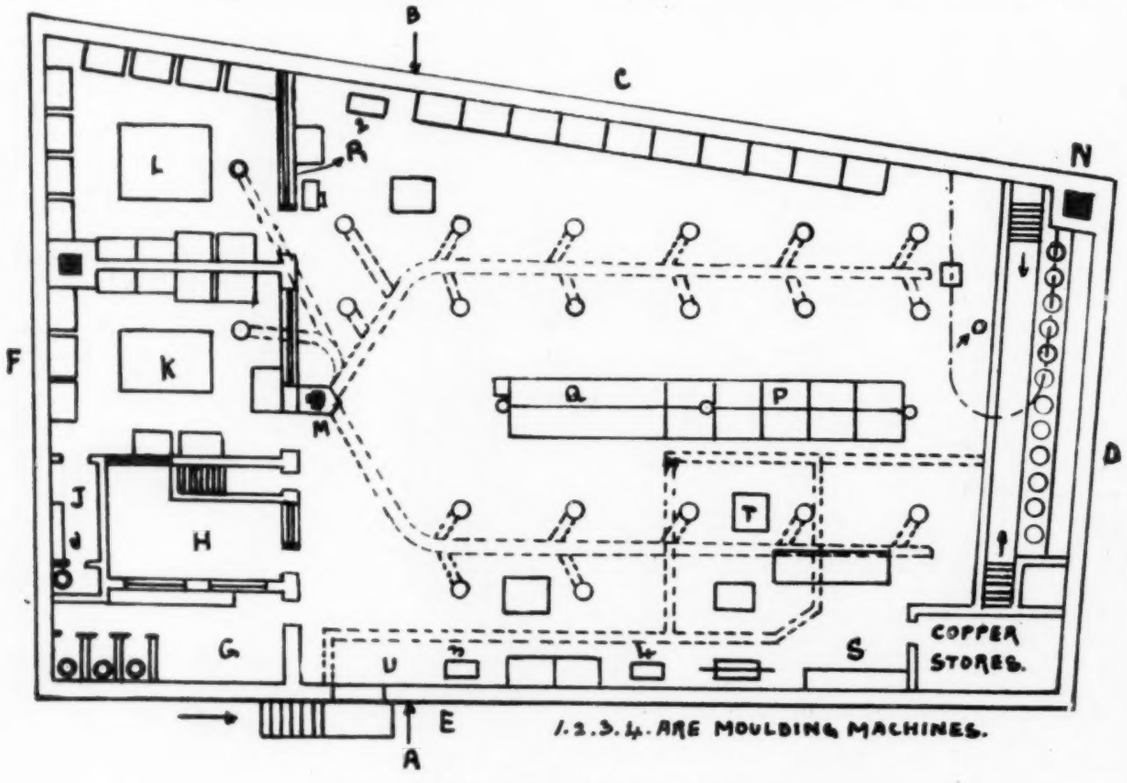


FIG. 1. THE GROUND PLAN OF THE FOUNDRY.

makes it possible for the United Brassfounders and Engineers, Ltd., to produce such high class work at reasonable prices. There are three essentials which must operate in the making of a good foundry, viz: (1) A properly laid out building. (2) Proper tackle. (3) Good organization.

We recently visited the Halifax branch (Messrs. Gaukroger, Sykes & Roberts) of the above firm, and were delighted with the arrangement of the foundry. We were received by Mr. Sugden, the most practical brass foundry manager it has been our privilege to meet. Mr. Sugden is a man who has his heart in his work, and he took the greatest pleasure in giving us all the information possible as to the working of his foundry; the firm have very wisely taken him into their full confidence—he is not only the manager of the Halifax foundry, but consulting brass founder for their other three branches, Manchester, Birmingham and Woodchester. We consider the people of the world in the aggregate as constituting one huge "machine," of which all are members or component parts. For this "machine" to be efficient,

every member should be in a position and possess such information as to enable him to do his work in the best possible manner, and thus get the greatest amount of work out of this large "machine." To help the brass foundry section of these members to perform their work

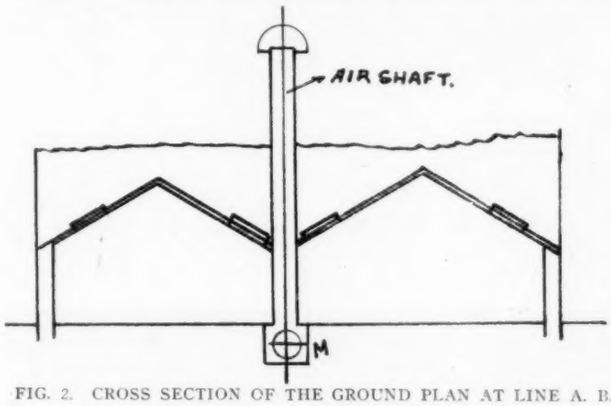


FIG. 2. CROSS SECTION OF THE GROUND PLAN AT LINE A. B.

in an efficient manner we take this opportunity of placing before them a description of this well arranged foundry.

GENERAL LAYOUT.

The ground floor of this foundry has an area of 7,260 square feet and is covered with cast iron plates which makes it possible to sweep clean (this is done twice daily) and thus all scrap is gathered easily—the total loss in every way only amounts to 4 per cent. or 5 per cent. Fig. 1 is a ground plan and Fig. 2 is a cross section at A. B. The height to the top of girders supporting the roof is only about 10 feet, as will be seen in Fig. 4 when the height of the man in the foreground is compared with that of the girder. This at the first glance seems quite wrong when one considers the present day practice of having lofty rooms for work people, as being the healthiest, but when the system or plan of ventilation is given, the reader will see the wisdom of a low roof in this instance. The roof is of two spans as shown in Fig. 2, and that portion over the work benches is of glass as seen in Fig. 3, this being the source of light during the daytime. The ground plan Fig. 1 shows the disposition of the plant and air ducts. At the end marked F the building is of two stories, the ground floor being used for men's lavatory and W. C., (H) manager's office, (J) girls' lavatory cloakroom and W. C., (K) core making shop for girls and (L) core making shop for men (see also Figs. 5, 8, 9). The upper floor is used for pattern stores, pattern making for wood and metal patterns (Fig. 7), and drawing office which is partitioned off from the pattern shop but not seen in photograph. Long porcelain troughs a. a. are used in the lavatories for washing purposes, and the water (hot) is served from taps through a "rose" so that the water comes out in a spray, and as there is no plug in the troughs the water is continually flowing while washing and all dirt runs down the drain pipe at once, and the troughs are kept comparatively clean. This washing arrangement is greatly appreciated by the work people.

FIG. 3. A PORTION OF ONE SIDE OF FOUNDRY. THE FOUNDRY IS 110 FEET LONG BY 66 FEET WIDE. THERE ARE 12 FURNACES WHICH ARE CAPABLE OF DEALING WITH 7 TONS OF METAL PER WORKING DAY OF 10 HOURS.

VENTILATION.

The ventilation of all the rooms, where noxious gases are encountered, and which are particularly bad in a brass foundry is practically perfect. At M, Fig. 1, is shown a 24-inch fan driven by its own electric motor, which draws fresh air down a shaft 35 ft. high and well above the

foundry roof, forcing it through two main air ducts 17 inches diameter reduced to 12 inches diameter placed underneath the floor. From these main air ducts there are branches 6 inches in diameter leading to circular grids fitted into the cast iron floor plates, which can be shut at will. These gratings are placed in such a position in the floor that the workmen at the benches are clear of the draft or current of air passing upwards to the ventilators in the roof. Exhaust fans are fixed in the roof which draw out all the foul air to the atmosphere. As is well known the fumes which arise from the crucibles and molding boxes when casting brass are very heavy and should be drawn away while in a hot state, otherwise they fall. If the roof is lofty the gases have time to cool before reaching the atmosphere, and the time taken to get rid of them is considerable. As already stated the roof in this foundry is low and the fumes are drawn through

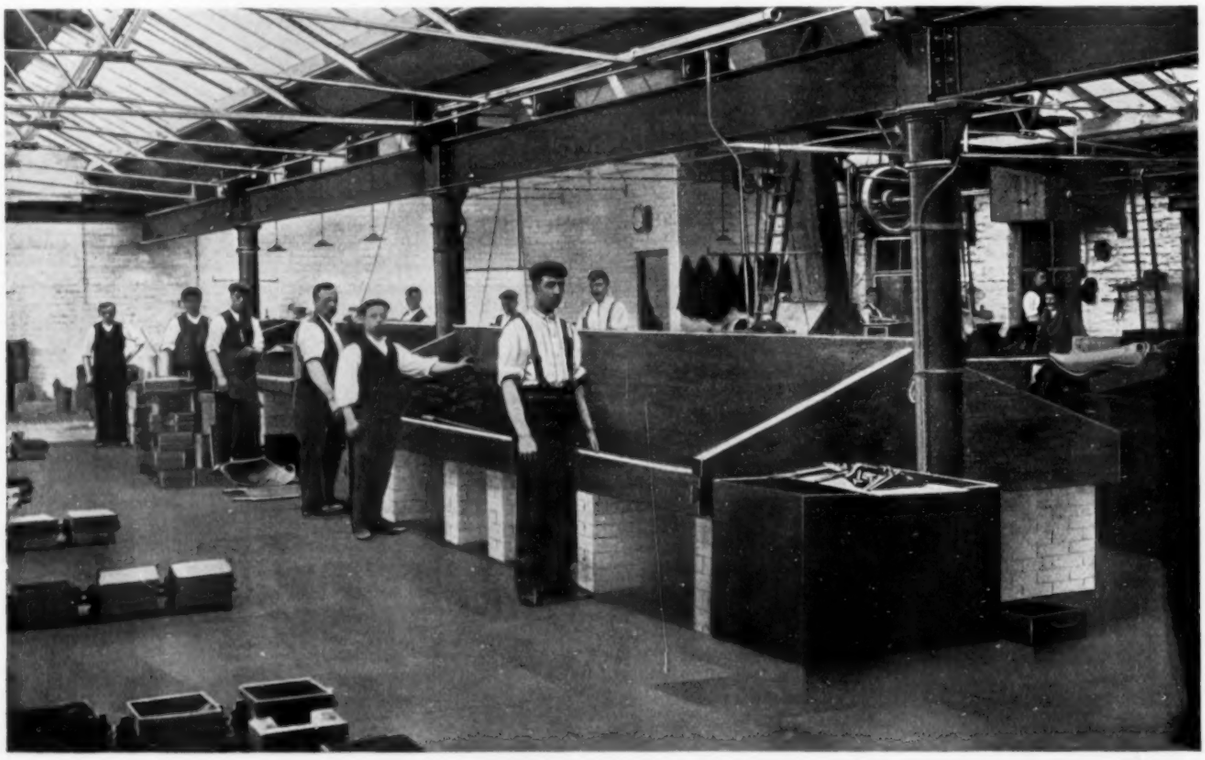


FIG. 4. THE ABOVE VIEW SHOWS A PORTION OF THE CENTRE OF THE FOUNDRY. THIS FOUNDRY HAS BEEN RECENTLY BUILT ON THE LATEST PRINCIPLES, BOTH FOR ECONOMICAL WORKING RESULTS AND FOR THE HEALTH OF THE EMPLOYEES.

it while in a heated, and consequently in a light, state, very quickly—in five minutes after casting the atmosphere of the foundry is clear of all noxious gases, and for this object the foundry was built with a low roof.

THE MELTING ROOM.

The melting of the brass is done at the end marked D, Fig. 1. There are twelve holes for pots having a capacity of 120 and 250 pounds. The furnaces are of the ordinary coke fired type and the flue from each goes into a main flue to the chimney which is in the corner at N. The trench in front of the furnaces is deep enough for a man to walk down and attend to the fires without stooping—the trench is entered at each end down the steps shown. The holes are covered with a specially designed cover, not merely a flat plate, but as shown by Figs. 10 and 11, the covers are lifted up by inserting a bar in the hole at front and they stand on their square end at A when pots are being withdrawn; this form of cover does not buckle and keeps the cold air out and the heat in, better than a flat plate. Over the holes for 250-pound crucibles is a "runway" from which is suspended a chain block attached to a carriage running on the bottom flange of rolled joist forming the runway. The 250 pounds are lifted out by the chain block and run clear of the trench as shown in dotted lines at O, Fig. 1—it only takes 30 seconds to do this.

THE MOLDING ROOM AND OPERATIONS.

Molding benches are placed along the whole length of wall C, Fig. 1, down the center of foundry P (the portion Q is used for sand mixing) and a short bench on wall E. Two molding machines are placed against partition R and two against wall E. The castings are dressed or fitted in the corner marked S, and also shown in Fig. 6, where there are emery wheels, a rumbler, circular saw, and brass boring cleaning machine, made by Parkinson of Bury, the magnets of which are fixed in screw fashion (really making a magnetized conveyor) in the box of the machine—these magnets generally last four to five years without being re-magnetized. The saw and grinding wheels are fixed on one bench, and the "swarf" from these is drawn by a fan into a box, the coarser particles falling at the front and the finer at the backs—to prevent the finer particles being drawn into the atmosphere a wire grating about ¾-inch mesh, is placed over the outlet in the box and is covered with wood shavings against which the dust impinges—these shavings are periodically beaten (when the fan is stopped) to make the dust fall to the bottom of the box; the coarser particles being withdrawn at one end and the finer at the other. The fan is driven from the same counter shaft which drives the saw and emery

wheels, so that the whole combination is started and stopped at the same time. Under the floor at T is the store for scrap brass, which is lifted up by a chain block —the entrance to this basement store is along passage U.

The molding sand is not ground in an edge runner mill, it is simply broken up and mixed with the spade on the bench Q, Fig. 1. The result of this apparent out of date plan is that the sand is never too "close," and the molds do not require venting, the gases being able to penetrate this somewhat loose body of sand without vents. Four hand-worked sand riddles are suspended over bench Q. At the end of this bench Q is a cast iron quenching trough, seen in Fig. 4. There are two rooms devoted to core making—room K for girls and room L for men, the men make the larger cores and the girls the smaller ones. A brick wall divides the two rooms, which is built into the chimney for core drying stoves. The stove for each room is placed against the dividing wall so that the one chimney does for both; they are made of thin plates and rest upon brick piers which also carry the coke fires. The stoves are of considerable length and each one heated with two fires. Hardwood core boxes are used and the loose parts inside are made of aluminum. The wires for globe valves are bent to the shape shown in Fig. 12. This shape of core wire is very easily withdrawn, the wire being soft. The wire is seized by a pair of pliers at A and pulled out only touching, or dragging against those parts of the casting which are not machined at band C, and can therefore do no harm. The girls are particularly smart at bending the wires to the required shape. Each core maker works on a separate bench so that the vibration caused by "rapping" is not transmitted to the next bench. No blacking is used on the cores—the gases getting away more readily without blacking, and the castings are not discolored, coming out of the sand a beautiful light straw color.

Particular attention is given to the work of "getting up" the metal patterns when making the wooden ones, so that there will be no "short" places on those parts which have to be filed up to the turned parts. The patterns are hollow shells, the outside of which is of the form required; this reduces the total weight of the plates when complete. No time or labor in this department is spared in making the patterns right in every particular, due regard having been paid to the contraction of thick and thin parts in the valves, etc. The molding boxes are made in very convenient sizes for the work carried out in this foundry—there are three sizes, viz.: 10 x 10 x 3 inches with straight sides, 12 x 12 x 3½ inches and 16 x 14 x 4½ inches, having the inside faces concave to hold the sand. Both edges of all boxes are planned level, as well as the facings on the "ears" to receive the pins. The boxes are very well made and fitted together—they are fixed one upon the other with three points so that the molds always match properly.

FIG. 5. A CORNER OF THE FOUNDRY. THE TWO CORE MAKING DEPARTMENTS ARE SEEN IN THE BACKGROUND; GIRLS ON THE LEFT AND MEN ON THE RIGHT.

The molding machines are those made by James Pickles, of Bradford, size B, the sand being pressed into the box by a pressing block worked with a lever. The table carrying the pattern plate is made to rotate on two trunnions. There is a table underneath which is made to rise and fall by means of another lever—this table receives the box as it leaves the pattern plate. These machines are very simple, no air compressing plant is required—the machines are complete in themselves, and may be placed anywhere, and their removal can be accomplished by two men with a pole, and a piece of rope, Chinese fashion. The cycle of operations in molding with these machines is as follows:

(1) The empty molding box is placed upon the table carrying the plate.

(2) Box cramped to the table with special quick action cramps.

(3) An iron "gauge" about 1¼ inches deep is put on the box to receive the superfluous sand.

FIG. 6. ANOTHER CORNER OF THE FOUNDRY.

(4) The pressing block is brought down and the sand pressed into the box as shown by Fig. 14.

(5) The pressing block and "gauge" lifted off.

(6) Sand strickled off level.

(7) Table and plate turned over together with the box.

FIG. 7. A CORNER OF THE PATTERN AND PATTERN PLATE MAKING DEPARTMENT.

(8) Bottom table lifted up to box.

(9) Cramps loosened.

(10) Pattern plate rapped with wooden mallet and bottom table lowered with box.

(11) Box put on a table for the purpose of having the cores fixed in position, and to be slightly white dusted.

(12) The boxes are closed, put on the floor and weighted.

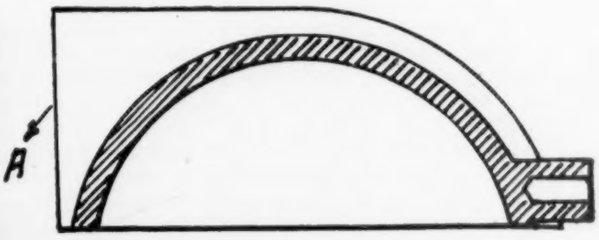
The weights, Fig. 13, are of rather a novel shape; the handle bar for lifting them is placed in the center of the mass of metal comprising the weight, so that when the bar is gripped in the hand the underside of the weight is horizontal and its whole surface goes on to the box at once. The opening at the side is made wide enough to clear the pouring hole or gate, and thus the pouring of the molten metal is not interferred with. The size of the gates and runners has received careful attention, so that they shall not be too small to ensure sound castings, and not too large, otherwise they would make more scrap than is absolutely necessary —the happy medium in point of size has been obtained.

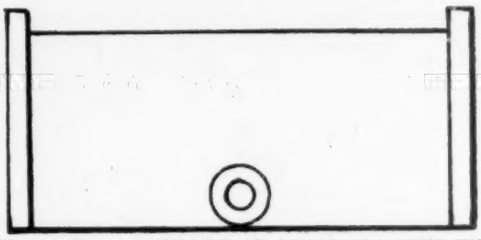
The molding machines are worked by unskilled labor, but a skilled molder puts in the cores and sees to it that the mold is all right before it is closed. This skilled man overlooks the work of two machines and is responsible for good and proper molds. The machine men are paid "piece work," but the skilled man is paid "day work," so that he has no interest in allowing bad or imperfect molds to pass, hence there are *very* few waster castings. The machine men pour or cast all their own work, but do not empty the boxes. The sand mixers empty the boxes on to the end of the sand mixing bench near to where the quenching trough is placed, and put all the castings on the floor to cool before being taken to the rumbler. One of these men picks up all castings with a pair of tongs (except those with plain cores) and quenches them in the trough—this is done to blow out the sand inside the castings, clearing out the cores most effectually and in a manner which could not be accomplished by rumbling; rumbling is, however, sufficient to clear out plain or straight cores.

As soon as all the boxes are emptied the sand mixers spray the sand with water, break it up, turn it over and riddle it in the suspended riddles. They then take the sand in tin scoops to the molding benches. There is a lot of molding done in this foundry by skilled molders, besides that done on the machines. About 70 boxes per ordinary working day are put down from each molding machine. To minimize the number of boxes, the "casting" is done every 2½ hours—this arrangement also keeps the melting furnaces going regularly which makes for economy in fuel. This foundry is worked night and day to meet the great demand for castings. When the castings are dressed they are put down a chute landing them on to a sorting bench in the casting stores, which is conveniently adjacent to the finishing shop.

All the molding boxes are cast in the brass foundry from specially selected tough iron which is melted in crucibles kept for that purpose. The first cost of castings

made in this way is much higher than would be if they were made in an iron foundry, but they are much stronger and at the same time lighter, than would otherwise be the case—thus they are cheaper in the end. All patterns not on plates are stored in box shelves in the pattern stores where a very large variety is kept to meet the special requirements of customers. The pattern is used with a plentiful supply of water, and as already stated, the total loss from every cause does not exceed 4 or 5 per cent. The artificial light is obtained from Keith-Blackman lamps. In the foundry there are six 300 C. P. lamps besides smaller lamps of 450 C. P. suspended over the molding benches, one for each molder. In each core shop there is one 150 C. P. lamp and a lamp





FIGS. 10 AND 11. DETAILS OF COVER FOR COKE FIRED PIT FURNACES.

FIGS. 8 AND 9. THE ABOVE VIEWS SHOW CORNERS OF THE MEN'S AND GIRLS' CORE MAKING DEPARTMENTS.

FIG. 12. SHOWING FORM OF CORE WIRE IN A GLOBE VALVE.

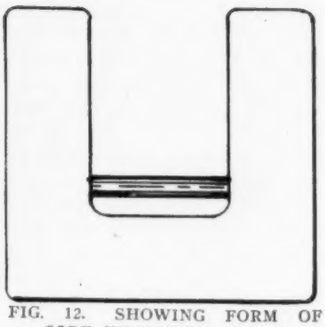


FIG. 13. WEIGHTS FOR HOLDING DOWN MOLDING BOXES.

plates are stored in wooden racks in the foundry, some of which are seen in Fig. 5—the racks are made of wood so as not to damage the patterns on the plates. In the pattern shop, Fig. 7, are made the wood and metal patterns—the latter are fitted on to the molding machine plates with the greatest care and accuracy by specially trained men. The machinery in this shop is driven by its own motor.

The grinding and washing of the ashes, etc., from the furnaces is done outside the foundry, an edge runner mill of 45 C. P. over each core maker's bench. It will thus be seen that the work people are well supplied with light and are able to do their work properly after the daylight has gone. We congratulate the owners of this excellent foundry, upon its successful working, and we are very much obligated to them for according us the privilege of visiting it, and for the opportunity it has afforded us of placing the result of the visit before our readers, to let them see what a brass foundry ought to be.

TEST BARS FOR NON-FERROUS ALLOYS*

By Jesse L. Jones.†

Standard test bars for cast iron[1] and malleable iron[2] have been adopted by the American Society for Testing Materials, but for obvious reasons they are not suitable for testing the non-ferrous alloys. The bar recommended for cast iron is 15 ins. long, 1¼ ins. diameter at the top, 1 3/16 ins. at the bottom, and cast vertically. It is poured like an ingot mold. A bar poured in a mold of this kind from manganese bronze would be drossy, due to the lack of a skim-gate, and porous owing to the lack of a riser.

The bar recommended for malleable iron is 1 in. square. 14 ins. long, cast horizontally without chills and with ends left perfectly free in the mold, heavy risers insuring sound bars. This bar could possibly be used for brass, bronze, etc., but it is much longer than necessary, 4½ ins. being ample. The provision that both ends of the test piece be left perfectly free in the mold is possibly unnecessary, in a bar 4½ ins. long, but in a bar 14 ins. long it is very necessary, as even when such a casting is gated at the center, the adherence of the sand may prevent free shrinkage and cause the test piece to be full of hair cracks.

In a paper[3] on the "Elastic Limit of Manganese Bronze," by Mr. J. A. Capp, tests on manganese bronze castings 24 ins. long by 1½ ins. diameter are described, rather low elastic limits being found. The writer tried this form of test bar, casting it horizontally with a heavy gate at one end. Apparently solid test pieces were obtained. They were turned up to give 1 in. diameter by 20 ins. parallel, and in every instance hair cracks appeared when the stress approached the breaking point. The value of data obtained on bars of this length is open to question, as free shrinkage is likely to be prevented. Mr. A. E. Outerbridge, in an article[4] entitled "The Integrity of Tests of Metals," advocates a uniform size of specimens, and uniform methods of molding, because the rate of cooling affects the micro-structure of alloys, and hence affects their physical constants. The practice of attaching coupon test pieces to important castings made from special bronzes and feeding these coupons by means of iron chills is inveighed against as giving results that are misleading.

Coupon tests are perhaps more largely used than any other form on propeller blades, hubs and other large castings, and they are used chiefly because they can be so readily attached to castings of many varying shapes.

Where it is possible to take a hollow drilled test piece from a casting, more representative results may be had than in any other manner. Several hundred tests made in this manner on manganese bronze discs weighing from 1,000 to 10,000 pounds each, cast in chill molds disclosed the interesting fact that rather large amounts of zinc vapor is given off from such castings, and a layer of metallic zinc will soon form on the iron chills to the thickness of ¼ in. or more. If poured at too high a temperature, blow holes may result from this volatilization of zinc, and while no experimental proof is at hand, it is likely that the reduced tensile strength and ductility observed in the upper or riser portion of these castings and similar large castings may be due to a thin envelope of metallic zinc surrounding the crystals of the bronze. Hollow drilled samples cannot be obtained from all castings, nor is it feasible to attach coupons in many cases. Hence it seemed desirable to ascertain the relative merits of a number of forms of test bars that have been suggested. Two sets of these bars were cast from manganese bronze, and one set from red brass. The following is a description of the different patterns used, methods of gating, risers, etc., and the physical data obtained:

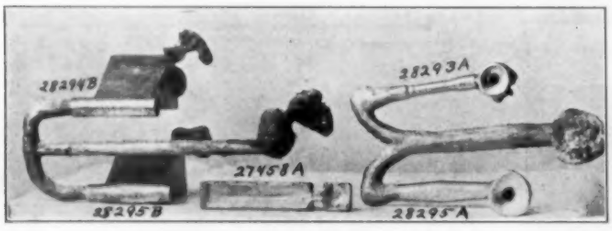


FIG. 1.

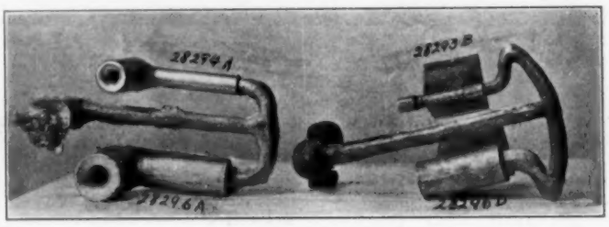


FIG. 2.

SOME FORMS OF TEST BARS THAT HAVE BEEN SUGGESTED FOR A STANDARD.

PATTERNS.

Pattern No. 27,458-A.—This is a cast iron mold 9 ins. long by 2¼ ins. high. The metal is poured into a well 1½ ins. square and 1¼ ins. deep, from which it runs through a V-shaped slot to form an ingot 6 ins. long by 1¼ ins. square. The slot is supposed to hold back the dross and oxides which remain in the well, only the clean metal running into the ingot. See Fig. No. 1.

Pattern No. 28,293-A.—This pattern is based on the American Society for Testing Materials standard tensile specimen for steel. It was made 4½ ins. long, 9/16 in. diameter in the body, and ¾ in. diameter at the ends, so that when cast it would have a minimum weight, but still finish to the dimensions of the standard steel test piece. See Fig. No. 1 for this test piece, without riser, and Fig. No. 2 (Pattern 28,293-B) for the same test piece with a riser.

Pattern No. 28,294-A.—This pattern is 4½ ins. long by 1 in. in diameter. See Fig. No. 2 for this test piece cast without a riser, and Fig. No. 1 (Pattern 28,294-B) for the same test piece with a riser.

Pattern No. 28,296-A.—This pattern is 4½ ins. long by 2 ins. diameter, and was designed to illustrate effect of a rather large cross-section as compared with a small cross-section which we have in Pattern No. 28,293-A. See Fig. No. 2 for this test piece, which is cast both without and with a riser.

Pattern No. 28,295-A.—This pattern is 4½ ins. long, but barrel-shaped, being 1⅛ ins. diameter in the center and ⅞ in. diameter at the ends. It was designed to allow a free shrinkage toward the center from each end, and was intended to be gated at the center instead of the ends. See Fig. No. 1 for this test piece, which is cast both without and with a riser.

Pattern No. 28,292-A.—This is a form that has been used by Paul S. Reeves & Son, Philadelphia, for a number of years. It is practically a block 4½ ins. long, 3 ins. wide, and 4 ins. deep, carrying on its drag side a test bar

* Paper read at convention of American Institute of Metals, Buffalo, N. Y., September 23-27, 1912.

† Metallurgist, Westinghouse Electrical & Manufacturing Company, Pittsburgh, Pa.

4½ ins. long by 1 in. square. The pattern was modified in accordance with a recent suggestion of Mr. G. H. Clamer, so as to provide three test bars instead of one, and the bars were also filleted. See Fig. No. 3.

Pattern No. 28,297-A.—This pattern provides for a wedge-shaped casting ⅞ in. thick at the bottom and 1½ ins. at the top. It is 4½ ins. long and 4 ins. deep. It was cast alone, but is designed to be attached to large castings and broken off by means of a sledge-hammer, being under-cut to 1 in. thickness where it joins the casting. This form of test piece was recently seen on some large propeller blades and hubs at the plant of the Bayonne Casting Company, Bayonne, N. J. The castings were of Monel metal and made for the United States Navy. See Fig. No. 3.

mold speed was 2,000 r. p. m., and the whirling was stopped as soon as the metal was set.

METHOD OF GATING.

The method of gating is shown in Figs. No. 1, 2 and 3, The very long sprues serve to remove the oxide and dross, and give clean castings.

MOLDING, POURING, ETC.

The molds were all made by the same molder from one lot of sand, uniformly tempered. The manganese bronze was from a lot of 10,000 pounds made at one time in the Schwartz furnace. It was remelted in a crucible and all the test bars were poured from the same crucible. It was anticipated from previous experience

FIG. 3. A GROUP OF PROPOSED STANDARD TEST BARS SHOWING METHODS OF "GATING."

Pattern No. 22,861.—This pattern is based on the vertically cast U-shaped form recommended to Wm. Cramp & Sons Ship and Engine Building Company, Philadelphia, by the Manganese Brass & Bronze Company, of London, England. One leg of the U forms the pouring gate, and the other (which is provided with a riser) forms the test bar. A step was introduced into the pouring gate to break the fall of the molten metal. See Fig. No. 3. Rings centrifugally cast in a metal mold were also made, the dimensions of the rings being 8 ins. outside diameter, 1½ ins. face, and a varying inside diameter depending on the amount of metal poured into the apparatus. The that the ingot test and those from the well-fed sand castings would be practically identical, but the tensile strength of the sand castings was so high, and their ductility so low, that an investigation was made and it was found that the molder pouring the castings had dipped them into water while they were still red hot, in order to get a fine golden color. As it is a well-known fact that manganese bronze castings cannot even be sprinkled with water without their ductility being reduced, this series of test bars, which is marked "A," was supplemented by a second series marked "B," which were allowed to cool normally. The results follow:

PHYSICAL TESTS, MANGANESE BRONZE—SERIES "A."

Serial.	Pattern.	Mark.		Tensile Strength.	Yield Point.	Elastic Limit.	Elg. 2 Ins.	Red. of Area.
29,765	27,438-A	Ingot		69,800	32,700	15,700	38.5	50.5
29,766-A	28,293-A	9/16 ins. dia.	No Riser	56,125	46,300	28,700	2.0	9.6
29,766-B	28,293-B	9/16 " "	Riser	78,800	45,300	27,900	9.0	14.3
29,767-A	28,294-A	1 " "	No Riser	42,375	42,375	26,000	1.5	8.8
29,767-B	28,294-B	1 " "	Riser	86,350	44,450	28,600	21.2	9.6
29,768-A	28,296-A	2 " "	No Riser	76,800	44,000	27,000	9.0	14.5
29,768-B	28,296-B	2 " "	Riser	86,175	49,500	27,000	20.0	24.0
29,769-A	28,295-A	Barrel	No Riser	35,725	35,725	20,500	1.2	7.3
29,769-B	28,295-B	"	Riser	86,875	45,350	30,000	24.2	9.6
29,770-A	28,292-A	Reeves		79,400	47,500	27,300	11.2	9.6
29,770-B	28,292-B	"		83,375	45,500	27,500	14.2	11.6
29,770-C	28,292-C	"		83,725	48,750	27,500	17.2	20.5
29,771-A	28,297-A	Bayonne		58,200	47,500	27,200	2.6	7.8
29,771-B	28,297-B	"		82,250	50,000	27,200	14.5	17.3
29,771-C	28,297-C	"		85,800	48,000	27,900	20.5	21.1
29,772	22,861	U-shape		65,975	20,250	28,800	5.0	9.6
29,774	....	Centrifugal		73,000	40,000	24,500	32.5	44.5

MANGANESE BRONZE—SERIES "B."

Serial.	Pattern.	Mark.		Tensile Strength.	Yield Point.	Elastic Limit.	Elg. 2 Ins.	Red. of Area.
30,088	27,438-A	Ingot		71,250	37,500	17,300	38.5	41.0
30,083-A	28,293-A	9/16 ins. dia.	No Riser	45,625	31,000	16,000	4.0	11.6
30,083-B	28,293-B	9/16 " "	Riser	55,000	32,250	22,000	9.2	18.5
30,084-A	28,294-A	1 " "	No Riser	28,075	27,300	11,300	2.5	9.6
30,084-B	28,294-B	1 " "	Riser	67,300	32,300	13,300	26.7	29.5
30,086-A	28,296-A	2 " "	No Riser	68,225	31,500	13,600	30.0	30.8
30,086-B	28,296-B	2 " "	Riser	68,025	26,750	13,600	38.0	30.8
30,085-A	28,295-A	Barrel	No Riser	29,450	27,500	13,500	1.2	5.9
30,085-B	28,295-B	"	Riser	67,825	34,250	16,700	30.5	29.5
30,082-A	28,292-A	Reeves		69,400	33,300	14,250	38.5	37.4
30,082-B	28,292-B	"		69,275	32,000	14,250	38.2	38.2
30,082-C	28,292-C	"		69,125	33,400	13,100	37.0	37.2
30,087-A	28,297-A	Bayonne		18,500	16,500	7,900	1.5	7.8
30,087-B	28,297-B	"		68,100	35,000	14,200	32.0	32.5
30,087-C	28,297-C	"		68,975	33,500	14,200	34.7	30.8

RED BRASS.

Serial.	Pattern.	Mark.		Tensile Strength.	Yield Point.	Elastic Limit.	Elg. 2 Ins.	Red. of Area.
29,802	27,438-A	Ingot		44,700	20,000	10,500	45.0	46.2
29,803-A	28,293-A	9/16 ins. dia.	No Riser	38,625	18,000	9,500	33.5	38.5
29,803-B	28,293-B	9/16 " "	Riser	38,575	17,500	10,600	40.0	38.8
29,804-A	28,294-A	1 " "	No Riser	33,000	16,250	9,250	28.7	29.2
29,804-B	28,294-B	1 " "	Riser	33,000	15,900	9,000	30.1	37.2
29,805-A	28,296-A	2 " "	No Riser	31,500	14,050	7,800	28.2	36.9
29,805-B	28,296-B	2 " "	Riser	27,600	14,000	7,600	18.5	27.5
29,806-A	28,295-A	Barrel	No Riser	36,325	16,875	10,000	38.7	37.2
29,806-B	28,295-B	"	Riser	33,625	15,750	12,750	32.7	38.9
29,807-A	28,292-A	Reeves		32,425	15,250	9,400	29.7	35.0
29,807-B	28,292-B	"		31,575	15,700	8,700	28.7	35.0
29,807-C	28,292-C	"		32,900	15,250	9,200	28.9	30.8
29,808-A	28,297-A	Bayonne		31,000	14,000	8,400	28.5	31.2
29,808-B	28,297-B	"		25,425	14,000	8,400	16.8	15.0
29,808-C	28,297-C	"		31,050	15,500	9,500	27.0	26.0
29,811	.....	Centrifugal		44,175	26,550	14,600	23.7	27.5

As it is not desirable to put any more metal in a test bar than is absolutely necessary, the weight of the forms experimented with is given in the following table. Perhaps the risers are heavier than necessary, and the long skim gates used on the manganese bronze castings would be unnecessary with red brass.

WEIGHT OF TEST PIECES.

Pattern.	Mark.		As Cast.	Ready for Machining.
27,438-A	Ingot		3 pounds 4 ounces	2 pounds 12 ounces
28,293-A	9/16 ins. dia.	No Riser	9 " 9 "	— " 8 "
28,293-B	9/16 " "	Riser	16 " 4 "	— " — "
28,294-A	1 " "	No Riser	10 " 1 "	1 " 1 "
28,294-B	1 " "	Riser	16 " 12 "	— " — "
28,296-A	2 " "	No Riser	13 " 12 "	4 " 3 "
28,296-B	2 " "	Riser	21 " 12 "	— " — "
28,295-A	Barrel	No Riser	11 " 2 "	1 " 3 "
28,295-B	"	Riser	17 " 15 "	— " — "
28,292-A	Reeves		45 " 8 "	3 " 9 "
28,297-A	Bayonne		16 " 9 "	3 " 8 "
22,861	U-shape		10 " 11 "	1 " 12 "

IMPORTANCE OF TEST PIECES.

The results of tests made on manganese bronze, Series A, emphasizes the importance of the normal cooling of manganese bronze castings if constant results are to be had. Dr. William Campbell, of Columbia University, New York, inspected the fractures of this series of test pieces while on a recent visit to this laboratory, and subsequently made photo-micrographs of one of the abnormal specimens (quenched), which showed a low elongation, and one of the normally cooled specimens with a high elongation. His notes on these speciments follow:

"Normal Structure—Two constituents, alpha and beta, shown in Fig. No. 4; magnification 45 diameters, etched with nitric acid, structure very uniform and similar to Muntz metal (copper 60, zinc 40). Abnormal Structure: Fine grained, main mass of beta full of small inclusions of a whitish constituent that resembles gamma of the high zinc brasses. Fig. No. 5 shows this sample etched with nitric acid, and Fig. No. 6 etched with ammonium persulphate to show up the grain structure. A section of the normal sample was heated to 750 to 800 degs. C. and quenched. Complete rearrangement 'abnormal.'"

A section of the original abnormal sample was heated to 825 degs. C and slowly cooled. Outside rearranged to normal alpha and beta, interior unchanged. Reheated to 825 degs. C. and slowly cooled in furnace. Change

has gone a little deeper. If alloy had been held at 825 degs. C. for some time, then very slowly cooled, change would have been complete.

The abnormal sample examined by Dr. Campbell was No. 29,770-B, of the Series A table given above, and the normal sample was a hollow drilled test from a disc weighing 1,150 pounds, the routine shop test on which gave 72,100 tensile, 36,500 yield point, 33.2 per cent. elongation, and 32.5 per cent reduction of area. It was cast in an iron mold, while sample No. 29,770-B was cast in sand.

OTHER FORMS OF TEST PIECES.

A form of test block that is said to be used in France consists of a short cylinder carrying on its outside surface four or more vertically placed coupons about 4½ ins. long by 1 in. square.

FIG. 4. Normal structure of manganese bronze etched with nitric acid, magnified 45 diam.

FIG. 5. Abnormal structure etched with nitric acid.

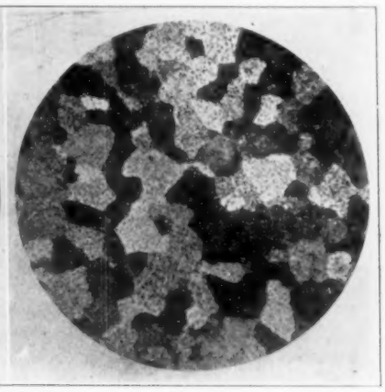


FIG. 6. Same as Fig. 5, but etched with ammonium persulphate.

CONCLUSIONS.

The average manufacturer is too busily engaged in production to go into investigative questions thoroughly, and hence it would be an excellent plan if the Bureau of Standards would take up the matter of further work on the subject of a standard bar for bronzes and brasses. The above work has been outlined with the hope that it may prove helpful to others, but with the realization that it is at the best but preliminary. The following conclusions have been drawn from the above tests, and from the writer's previous experience:

1. For acceptance tests of important brass or bronze castings, hollow-drilled tests are the most representative. They should be ⅞ in. in diameter and 4½ ins. long. They should be broken off by the use of a closely fitting iron pipe, and without bending the test piece except at the point of fracture.

2. Where the nature of the castings will not permit hollow-drilled tests, coupons are next to be preferred. They should be fed by chills. They should be filleted and placed vertically, if possible, so as not to retain the dross, oxides, cold metal, etc., that may arise along the sides of the mold during the pouring of the casting.

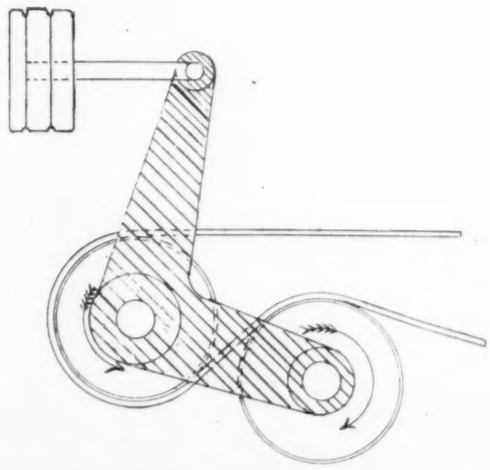
3. Where a test bar is wanted, representative of a lot of small castings, a small ingot like Pattern No. 27,438 is satisfactory. Such a bar is also excellent for comparing one alloy with another.

4. Where sand cast samples are wanted, any of the patterns given above are satisfactory, with the possible exception of Patterns No. 28,293 and 22,861. But risers must be used to feed the castings solid, and skim-gates must be added in the case of manganese bronze. Of the patterns tried, the writer prefers the barrel-shaped one, Pattern No. 28,295.

[1] American Society for Testing Materials Year Book, 1911, page 102.
[2] American Society for Testing Materials Year Book, 1911, page 104.
[3] Read at meeting of American Society of Mechanical Engineers, June, 1910.
[4] Journal of Franklin Institute, October, 1910.

A BELT TIGHTENING IDLER.

How many times have you in your travels through factories, detected the odor of burnt leather, due to an over-loaded or slipping belt, and then wonder if a thought had been given as to how to overcome these conditions, and help eliminate the cost of maintenance and increase the output per machine. Many accidents have been experienced and are caused from a too tight or slack belt. Also very short and nearly vertical belts are used universally with motor drive because with these it is necessary that the tension on the driving and driven bearings be in excess of the requirements, or the adhesion of the belt to the pulleys does not give the needed pull and a lost productive power is in evidence. A sketch of a very simple and practical tightening idler is here shown that can be applied to any belt running up and down or in an overhead position, and will avoid forcing a belt on the pulleys to make up for the stretching from a load. Thus, the required amount of pull that the belt may perform its functions properly will always be maintained. This idler may be carried by a spring control or weighted-arm, and mounted on the pulley shaft of the driver, making a compact outfit and one that is not troublesome and which adjusts itself to make up for all stretching.—By EASY WAY.



THE BELT TIGHTENING IDLER.

THE DRYING OF METAL ARTICLES BEFORE AND AFTER PLATING

By Albert Pott.*

The drying of metal articles during the finishing process, both before and after plating, is an important item and a source of much trouble and annoyance to many manufacturers. Perhaps the oldest method is that of drying by means of sawdust mixed with the articles, placed in a kind of pan and heated, the sawdust being turned or mixed occasionally by hand. Some concerns then had made a comparatively large shallow pan or table with raised edges, heated by steam coils underneath, and on which the work, mixed with sawdust, was spread, being stirred up periodically by hand. It was found, however, that unless the work was thoroughly mixed that the steam formed by the heat could not escape from the little mounds or hills, and caused imperfect drying, as well as leaving water marks. It can be readily noted that quite a floor space and much labor is required for this process, and with only fairly satisfactory results.

To overcome the troubles mentioned and also to save space and labor, a steam drying barrel was invented. This barrel is practically the same as the oblique tilting tumbler so very common in metal concerns, except that it was jacketed and otherwise constructed to allow a circulation of steam about the inner barrel, automatic ejection of the condensation, still allowing the barrel to be tilted, etc. This barrel has proved to be a decided success, as a barrel load can be thoroughly dried in a very few minutes, especially if the work is shaken out of hot water. It can be readily seen that the rolling over and over in the hot barrel thoroughly mixes the work and sawdust, liberates the steam and precludes all possibility of water marks, etc., and further, brightens the goods at the same time, and the sawdust is also quite dry, ready for the next batch. The floor space required is no more than for the ordinary tumbler of the same size, or about four by five feet. Actual users claim six times as much work can be easily dried and more thoroughly, as can be dried by the old way, besides the additional advantage of brightening the goods at the same time. Again articles containing pockets, etc., in which the wet sawdust would be liable to pack by the old method are more thoroughly dried because the rolling over and over shakes out the dry sawdust. Many concerns put this barrel to other uses, such as mixing liquids that require to be heated, etc.

THE BAIRD FANNING MILL.

A machine much used with the steam drying barrel, as well as other tumbling barrels, is the fanning mill shown. This machine, however, was originally designed and built to separate articles from sawdust that could not readily be riddled, such as common toilet pins, hooks and eyes and such like. Users of the machine for such purposes, however, found this method of separating so much more clean and sanitary than riddling, which caused the dust to fly about the room, etc., thus making it difficult for the workmen to breathe, and also caused a dirty room, etc., that they are using it for separating most any kind of article but deep shells and the like.

This machine consists of an inclined hopper, the inclination of which is adjustable, in which the work and sawdust, leather meal, etc., is put. This hopper is vibrated so as to cause the work to slide slowly down into a chute through which a current of air is forced, and which can be regulated to suit the work. The sawdust or leather meal, etc., is carried off into a bin built to receive it, and from which it can be used again, the work continuing down the chute, rolling over and over, thoroughly loosening and releasing the dust, etc., and drops clean, into a box or receptacle set to catch same. One operator with a steam barrel and fanning mill can take good care of a good-sized tumbling room. Another use to which this machine is put is that of separating the chips from wood screws, etc., after the oil has been separated as they come from the screw making machines. In such a case a bin is not required, but a sheet metal hood is formed to the end of the chute to deflect the chips downward into a box or barrel, or the chute could be put near a window and thus thrown outside into a scrap bin, etc.

BAIRD MACHINE COMPANY STEAM DRYING OBLIQUE BARREL.

*Baird Machine Company, Bridgeport, Conn.

METAL NOTES FROM INDIA.

The manufacture of aluminum ware is a comparatively new departure in southern India and promises to become a very important industry. In the fiscal year ended March 31, 1912, the imports of aluminum into the Madras Presidency were valued at $204,039. These imports were supplied by: Sheets—United States $19,115, Germany $7,939, Belgium $3,620, United Kingdom $15,977; ingots—United States $3,636, Germany $2,768, Belgium $1,516, United Kingdom $4,445; other sorts—United States $6,690, Germany $4,015, Belgium $852.

BRASS PLATING

SOME VALUABLE INFORMATION REGARDING THE REGULATION OF BRASS DEPOSITS.

BY L. G. KROUSE.*

L. G. KROUSE.

No doubt a great many brass platers are already familiar with the data incorporated in the following article, but those who are having difficulty in getting the desired color may find the information given herein of some value. Brass being an alloy of copper and zinc, it becomes necessary to bear in mind that the copper is the ruling metal, zinc being the base metal. In plating, these two metals must be alloyed by electricity, but their conducting powers are not equal when in the same solution. So before we can get good results we must equalize the conducting power of these two metals. As we cannot increase the conducting power of the zinc without affecting the copper, it becomes necessary to decrease that of the copper, which can be done without affecting the zinc, and when the conducting power of the copper has been brought down to an equal basis with that of the zinc, then the deposit will be under the control of the operator.

The only way to bring this about is the addition of ammonia, and when the proper amount is added, the solution will plate brass whenever the current is turned on.

Considerable care should be exercised in making additions of ammonia, as too much or too little will affect the color. In fact, enough ammonia can be added to the solution to entirely hold back the copper so that zinc alone will be plated as long as the amount of ammonia remains constant. However, when the amount of ammonia begins to decrease through evaporation or other causes, the deposit will be come a grayish-yellow, indicating that the copper is regaining its strength. Later on the deposit will become all yellow and then a pea-green, which is an indication that the solution is in its proper state and, if this is the color that is desired, no more ammonia should be permitted to leave the solution. And from this time on ammonia must be added, as otherwise the deposit will grow darker to bronze and finally large blotches of copper will appear, showing that all the ammonia has evaporated and the copper is predominant.

In regard to the amount of metal to put in a brass solution. The color that it is desired to plate should govern the mixture of metal that is placed in the bath. For instance, if a good green brass is desired, an alloy of two copper to one zinc would be the proper one to use. However, if one were to use a mixture of equal parts of copper and zinc, it would still be possible to obtain the green color, but the solution would soon become unbalanced. The reason is as follows: To obtain the green color, two parts of copper and one of zinc are drawn from the solution, whereas originally there was placed in the solution only one part of copper and one part of zinc. Therefore, in order to avoid troubles of this nature, always be sure to use the correct mixture for the shade you desire to plate.

The most troublesome factor in brass plating is the anodes. Many times they do not dissolve properly, and often the solution will have to be strengthened by the addition of fresh metals and chemicals. But having once mastered the color by the proper use of ammonia, you will find that it will also become the best barometer in indicating the condition of the solution. For example, should a yellow color appear, the plater will know that too much zinc is present; slow deposits denote insufficient copper; and violent eruptions show lack of both metals. All these things can be quickly remedied, and will become a secondary matter when once the operator has fairly understood the natural working qualities of the two metals, and he can then make them blend as he will.

*Foreman Plater, Bridgeport, Conn.

VARNISH AND OIL AS A SUBSTITUTE FOR LACQUER

BY EMMANUEL BLASSETT, JR.*

The present high price of amyl acetate, the solvent used in guncotton lacquers, has so raised the cost of lacquering as to be almost prohibitive on certain classes of work. In addition it has brought upon the market various cheap lacquers, containing mainly alcohol, that would spoil the finish of any work to which they are applied. For the past few months the writer has used a white varnish as a substitute for lacquer, on brass plated and oxidized work. It has been used with success on fire place fixtures, such as radiators, andirons, fire screens and similar goods.

A good white varnish properly thinned down with terpentine, will produce as good results as lacquer, and is especially adapted for large articles as previously mentioned. Varnish will flow down more evenly in the background, and offers more protection to the finish. In addition, it is transparent and brings out the finish properly. When purchased in not too small a quantity it is considerably cheaper than good lacquer, and is easier to apply. Varnish takes considerably longer than lacquer to dry, but this should not be a serious objection to its use. The deleterious smell of lacquer is not present and there is no danger of an explosion. The writer has used extra white damar varnish, manufactured by the Boston Varnish Company; two parts of turpentine to one of varnish is about the right proportion. As previously stated, this mixture is considerably cheaper than a good lacquer. It is not claimed that varnish may be used with facility on all classes of work, but for all large pieces, such as has been mentioned in this article, the writer considers it superior to lacquer in wearing qualities and appearance.

Another economical and efficacious method of protecting metallic surfaces, such, for example, as black nickel, gun metal and coslettized finishes, is the application of oil to the surfaces. Although this method is well known and extensively used at present, a wider use should be encouraged, as it may be used with good results on many articles that are now lacquered. Linseed and paraffine oils are generally used for this purpose. The linseed oil is the heaviest and offers the most protection against corrosion. Sometimes a mixture of the two is used with advantage. If a light oil is desired and one that is less perceptible on

*Foreman Plater, Burlington Mirror & Plating Company, Burlington, Vermont.

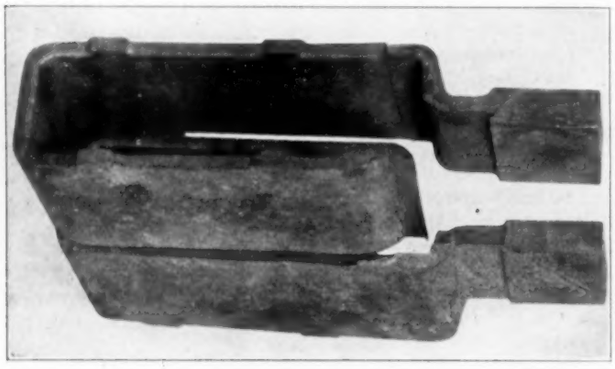
the surface, the paraffine oil should be used alone. The articles, if small, may be dipped in the oil and then thoroughly dried with a cloth. The usual method with large articles is to oil them with a cloth, then wiping dry.

PROGRESS OF WORK ON BORONIZED COPPER*

By Dr. E. Weintraub.†

It is usually the case that the man who contributes to the progress of a certain art is an expert in that art. I must begin my lecture, however, by frankly stating that at the time when I introduced the deoxidation of copper by boron I knew mighty little about foundry and foundry matters, and that even now I could by no means qualify as an expert. It is also usually the case that an improvement in an art is the result of considerable experimentation which either through persistent intelligent effort or through a lucky accident leads to success. No credit for great effort can be claimed in this case.

The process of boronizing copper was merely the result of a lucky idea which forced itself upon me through experimentation in a totally different line, namely, that of preparing the element boron in a pure state, a line of work which was begun primarily for the purpose of testing whether boron would be an appropriate substance for incandescent lamps. This is perhaps a good example of the correlation of different lines of investigation and of human effort. It demonstrates also the fact that scarcely can any truth be ascertained (no matter how abstract it may seem at a given time) which may not give practical results and help along in solving some practical problem.

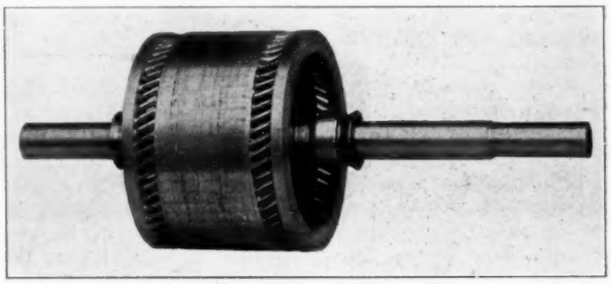


COMMUTATING POLE FIELD COIL MADE FROM BORONIZED COPPER.

The story is very short. After having isolated the element boron I was struck by the great affinity displayed by it toward practically every known element, whether metalloid or metal, but I was no less impressed by the apparent lack of affinity between boron and copper even at the melting point of the latter. I was carrying out the deposition of boron from boron chloride and hydrogen between water-cooled copper electrodes. Boron would deposit and grow on copper electrodes, but the latter would not combine with the boron and any copper mechanically adhering to the boron could be easily washed off with dilute acids.

I had often heard that it was difficult to produce cast copper mechanically sound and of high electrical conductivity and how the accomplishing of this would be desirable for electrical and other work. I said to myself that since boron has such a high affinity for oxygen, nitrogen, and oxygen-containing gases, which were probably, in one way or another, the cause of the difficulties in copper casting, and as boron, on the other hand, apparently had no affinity for copper, it was very probable that boron would be the natural deoxidizer for copper. I thought it might be worth while trying this out, but so many things look good in theory and yet do not work out in practice and it is so hard to tell beforehand which one of a number of good ideas will work and which will be a sore disappointment, that under the pressure of other work I let this idea linger in my mind a number of months before I actually tried it and then one day when there was, luckily, a lull in other work, I asked my assistant, Mr. Kroner, to try to add a small percentage of amorphous boron (boron suboxide) to copper and see what luck he would have. He added about 0.1 per cent., and after a short time brought me a sample bar which looked good. The same measured up to 94 per cent. conductivity of Matthiessen standard.

Surely here was an idea that worked without much effort and the further development of the method was just as easy as the start. Every simplification and every new idea that occurred to me was tried and every time the result did nothing but confirm the theory. The only difficulties I had were in trying to persuade the experts that the thing really worked and that they had to figure with a new process this time based on scientific reasoning and which had to be carried out accordingly. The first simplification consisted in the substitution of boron suboxide flux for boron suboxide. Boron suboxide is made by reducing boric anhydride with magnesium, aluminum, or an alkali metal, and chemical treatment of the reaction product. For copper casting it is, however, unnecessary to treat the product as the ingredients of it (excess of boric anhydride and of borate) outside of boron suboxide are harmless or even useful in diluting the active agent. Of this boron suboxide flux 0.75 to 1 per cent. has to be added (equivalent to 0.08 to 0.1 per cent. of boron suboxide).



INDUCTION MOTOR ROTOR OF BORONIZED COPPER (CAST WINDINGS).

This is the flux at present used. However, any material which contains boron in a state of oxidation below that of boric anhydride is a flux for copper casting.

Among other compounds of boron which satisfy this condition I mention boron carbide or any alloy of carbon and boron. In order to better make the boron react on the copper, or, rather, on the gases in the copper, I thought it would be best to superheat the copper, and I did that, although I was told that this is equivalent to ruining the metal. The copper, I was told, would "burn." The result was as I expected. After the process had been made to work many directions presented themselves for further investigation. First and perhaps the most important from the point of view of pure investigation was the

* Paper presented at the annual meeting of the American Institute of Metals, September 24 to 27, 1912, Buffalo, N. Y.

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question of what the boron flux actually does. We have no reason to doubt that the boron reduces some gas in the copper which is either oxygen itself or contains oxygen; it would be of great interest to ascertain the exact nature of the gas and the quantitative relations in the action of boron. We have not done this.

Another line was to study the deoxidation of copper alloys by boron. We have done a little on that and have ascertained that all the copper alloys containing the elements zinc, tin, lead, greatly benefit by being deoxidized by boron, but we have not done as much in this direction as we would like and as we eventually will. Another line of work would be to study the applications of the deoxidation by boron in the smelting of copper and although a beginning was made on that in the early stages of the work it has not been pursued in any systematic way and will have to be taken up again at the first opportunity.

What we *have* done was influenced by the fact that the process has been developed in an electrical company. The question was *what could we do* with the process, what electrical apparatus could be cast and thereby either save money or improve the product. It must not be forgotten that if copper could not be cast this did not cause the electrical industry to stop still. Rather had the industry developed all sorts of ingenious ways of working copper, or drawing, punching, drop forging, etc., etc., until the methods got so perfected that when means had been found for casting copper there was, at first, hardly a place where people thought they needed it. The very same people, by the way, were always going around sighing for the time when copper could be cast, commenting what a great thing this would be.

However, by this time we have got quite a distance toward replacing forged copper by cast copper. I would point to a selection of apparatus that I have brought along which represent but a few out of the large number of castings made at present. Meter fields, coils of current transformers, transformer terminals, series coils for interpoles, blow-out coils, large current switchblades, contact studs, secondaries of welding transformers, clamps of welding transformers, etc., etc., are now being regularly cast in boronized copper. Last, but not least, I will mention the success we had in casting the rotors of induction motors, either casting the short-circuiting ring around the forged bars or casting the whole armature. I have with me one in which the whole armature is cast, and it is a nice piece of casting.

Some of these apparatus are cast in sand molds and some, of simpler shape and used in large numbers, are cast in iron molds. To the latter class belong, among others, switchblades and meter fields. The advantages derived from the substitution of cast copper for forged copper are not only the saving in cost. In most cases, also, a better apparatus is obtained. It is possible in casting to eliminate a number of joints which are always a source of loss in efficiency. In the case of current transformers, for instance, not only a better apparatus is obtained at a reduced cost, but also space is saved. It is considerations like these, saving of money or space, or improvement of the quality of the apparatus, that have moved the engineers to replace forged copper by cast copper in every case they have done so.

The case of the induction motor is very interesting. In this case the main advantage of the cast rotor is its indestructibility and freedom from repairs. The rotor as ordinarily built up often develops poor contacts where the solder is applied between the forged bars and the short-circuiting ring which necessitates taking the rotor out and making repairs. As against this we had some cast induction motors run for years in very difficult places where overload was very frequent, without any need of repairs whatever. There remains for me to give you some details of how the process of boronizing copper is carried out and what precautions are to be taken in order to secure a good casting.

The boron suboxide flux can be added to the copper in different ways which are equally good. In the Lynn foundry our pots contain about 125 pounds of metal and up to the present coal furnaces have been used. The method used in the Lynn foundry consists in mixing half of the boron flux to be added with charcoal, putting it on the bottom of the pot and melting the copper down. When the copper has reached the necessary temperature (the copper can be heated too low but not too high) the pot is taken out, the slag skimmed off and the second half of the boron flux added and thoroughly stirred in. After a minute or so the slag comes up to the surface in the form of fused lumps and is skimmed off and the melt is cooled down by adding gates or risers until the proper pouring temperature is obtained.

In case a reverberatory furnace is used, as in Schenectady, the procedure usually followed is to put the flux in the ladle pot on the bottom, pour the copper over it and stir thoroughly.

The skimmer and stirrer are preferably not of iron since it is difficult to avoid a solution of a slight amount of iron in the copper and a resulting lowering of conductivity. If done very carefully the amount of iron would probably be very small, but we did not find it practicable to trust the foundry men with an iron skimmer or stirrer. Heavy graphite stirrers and skimmers, made of Acheson Graphite, have proven sufficiently rugged for use and are being constantly used in the foundry.

The boronizing process delivers a good metal and the production of a good casting depends now on the same factors as in other metals. The copper shrinks rather considerably, about ¼ inch to the foot, and this must be taken into consideration. The casting must be well fed and the sand mold must be rammed only very lightly. In case of iron molds, the iron must, of course, be covered with soot, and in some cases it was found desirable to use a graphite plate where the hot metal first strikes. In the case of induction rotors it was necessary to overcome difficulties due to the shrinking and cracking of the different parts of the copper casting. When these precautions are taken no more difficulty is experienced in casting copper than in casting ordinary brass.

The electrical conductivity obtained can be as high as 97 per cent. of the Matthiessen standard, but in the foundry, using scrap, which is not always as clean as could be desired, we find it not feasible to guarantee more than 90 per cent. conductivity. The mechanical properties are as follows.

Tensile Strength.	Elastic Limit.	Elong.	Red. in Area
24,350 lb. per sq. in.	11,450 lb. per sq. in.	48.5%	74.49%
17.0 Kg. per sq. mm	8.0 Kg. per sq. mm.		

CHINESE GRAPHITE.

The graphite is apparently wholly amorphous and shows no flakes like that mined in Pennsylvania, New York, and Canada, and no fibrous structure like that of Ceylon. After being raised to the surface the graphite is spread out to dry, which it does in a short time, and then is thrown up in piles to await shipment.

PRODUCTION OF MANGANESE.

The world's output of manganese for the year 1911 was 1,485,746 tons, of which India and the Caucasus produced nearly three-fourths.

SPOTTING OUT

SOME SUGGESTIONS FOR ITS CAUSE AND CURE.

BY GEORGE B. HOGABOOM.*

In nearly every case where the cause of "spotting out" is considered the metal which has been electro-plated is said to be the seat of all the trouble; either the metal is too porous, some pickle has been absorbed, or some of the plating solution has crystallized in the pores. This seems strange when this peculiar phenomenon, if it may be called such, occurs on so many different articles. Cast iron, whether sand-blasted or pickled (to remove the molding sand), cold rolled steel, spelter castings, and even sheet zinc, when plated in a cyanide bath, "spot out." Strangely, too, minute pinholes can be detected upon the guilty metal whether it be cast or rolled. The microscope reveals them, so they must be there. Imagination probably oftentimes comes to a timely rescue, and so the metal must bear all the blame. So it must be boiled out in a neutralizing solution, subjected to an alternate hot and cold bath, or left for weeks in some dry, hot atmosphere.

One thing seems to have been entirely overlooked, and that is the way in which the deposited metal is put on. There are definite laws controlling the deposition of metals and although the violation of them may not be intentional and the results not readily seen, it must of a necessity follow that if the deposition is not carried on within the limits of these laws bad results will most certainly be had. It is too well known to go into details, that oxygen and hydrogen gas are released at the positive and negative poles respectively, during the process of deposition. In a nickel solution when too much hydrogen is released the work becomes "pitted." This is caused by too high a voltage or too much free acid in the bath. Nickel being a hard metal and having a close grain, even the slightest "pitting" is readily discernible. Does not the same phenomenon occur in a cyanide copper or brass solution? Hydrogen and oxygen are certainly released. Then if too high a voltage is used, or the solution contains too much free cyanide, does not the deposit become "pitted"? It may not be visible to the naked eye, but it surely must be revealed by the microscope. Then again, copper or brass can be deposited faster than nickel, and consequently the crystals deposited are smaller. The structure being more dense and the "pitting" is so slight that the action of the electricity can master the escape of the hydrogen atoms and occlude, or shut them up, in the deposit. When the article plated is dried this shut up hydrogen fights with all its might to be released and its molecules, the smallest of all molecules, force themselves through the pores of its metallic coating; and, probably combining with the infinitesimal amount of cyanide that is deposited with the metal, discolors the surface of the work, even though a coating of another metal has been applied over it.

So, it would seem, that "spotting out" is caused by the condition of the solution and the amount of voltage used rather than the pores of the metal itself, although the pores, in the case of casting metal may retard the escape of the hydrogen gas and materially help to shut it up. If this is really the cause of "spotting out," is the plater entirely to blame? Not at all times. The American manufacturers' desire to push everything in production departments to the limit is probably more at fault than the plater. There were never and probably never will be solutions that can deposit their metal fast enough. The plater is compelled to push them to the limit. He must use as high a pressure as possible to get the work out in the least possible time. The solutions becoming poor in metal, or, the plater thinking to get a greater conductivity, creates a large amount of free cyanide. In either case, that of too high a voltage, or too much free cyanide, the development of the hydrogen gas becomes greater than in a normal, well-balanced solution. In conclusion, try a solution with as little free cyanide as possible and use the standard amount of pressure (voltage), and see if your "spotting out" troubles are not partially if not wholly eliminated.

* Foreman Plater, Archibald-Klement Company, Newark, N. J.

THE OIL OR CRUCIBLE FURNACE

WHICH IS THE BEST OR THE MOST ECONOMICAL FOR THE BRASS FOUNDRY?

BY HUGH MCPHEE.*

The Crucible Furnace is a good one, but is a little too slow where there is much metal wanted. Now I speak of the natural draft crucible pit furnace where coal is used. Take a No. 100 crucible and put it in the furnace with six inches of coal at the bottom of the furnace, then coal the crucible up to within three inches of the top, as the heat from all coal above this goes up the chimney without doing any good. Then the crucible is charged with steam metal mixture: 84 pounds of copper, 8 pounds of zinc, 5 pounds of tin and 3 pounds of lead. 50 pounds of grates, 50 pounds of chips or borings and 100 pounds of good composition will make a good steam metal when properly melted, which is very essential. This metal will take from 2½ to 3 hours to melt ready to pour into the moulds for making steam valves, and the loss will be 3½ to 4 per cent.

Coal to supply a number of crucible furnaces is quite a question these days—the room it requires and taking care of the ash. It takes about 150 pounds of coal for 300 pounds of metal for a No. 100 crucible, which costs $5, and will run for an average of 15 heats. Fifteen heats would practically take one ton of hard White Ash Egg Coal at a cost of $7 or less in large quantities.

In oil furnaces I have melted 700 pounds of bearing metal in 55 minutes. For one heat it takes 15 gallons of oil at a cost of 3 cents per gallon, with pressure of from 12 to 14 ounces, thus figuring 15 heats; the cost is about $6.75. The cost of running an oil rotary furnace is much less than coal and produces 10,300 pounds of metal; while the coal furnace produces only 4,500 pounds. Fifteen heats on the rotary furnace will be a little more expensive in repairs than the crucible furnace, about 50 cents against 15 cents, but when one considers that he melts three tons more metal he can well afford this. The oil can be kept in a tank under ground in the yard. The melter on the oil furnace must be thoroughly taught to understand combustion. The rotary oil furnace must be cleaned out every heat. Good ventilation in the foundry where oil furnaces are

*Manufacturer of McPhee's patented match-plates.

used is imperative, as the fumes are very detrimental to the health of the men.

The 700 pounds metal spoken of above contained ½ of 1 per cent. of phosphorus, 80 per cent. copper, 10 per cent. tin and 10 per cent. lead. This was melted in a Rockwell furnace with oil burners in each end, using both burners. This metal must be watched very carefully. Just as soon as the copper is melted the tin and lead must be put in, then take some hardwood blocks and throw them into the furnace. This protects the metal and prevents the tin from segregating. The comparison of the melting point of tin at 450 deg. F. with 1,900 or 2,000 deg. F. for copper shows how readily the tin would separate out in the metal body.

In using phosphorus I use the stick variety. I put 10 pounds of phosphorus in a stone crock and cover it with water to which has been added 2 pounds of copper sulphate; a coating of copper is thus formed on the phosphorus, which enables it to be handled easily without danger. Take 4 or 8 ounces of this phosphorus and put it in the bottom of a Number 50 heated crucible, then pour the metal out of the furnace into the hot crucible on top of the phosphorus and you will get good phosphor bronze with a small per cent. of loss. This metal is used for bearings for automobiles and is one of the best metals made.

SUSTAINED EFFORT

SOME PHILOSOPHICAL REFLECTIONS UPON THE VALUE OF CONCENTRATION AND APPLICATION AS APPLIED TO PATTERN MAKING.

BY W. H. PARRY.*

In training our young men to fit themselves to become proficient at various occupations, professions and trades that are to be their life-work, there is a point often lost sight of by both tutor and the tutored, and that is the training necessary in the line of sustained effort or "stick-to-it-iveness." How often we see young men when given a task to do, be it other than a very short spurt that will carry them through to the end of the job, gradually slow up until it is a question of whether by a very casual overseeing of the task at hand by the tutor or foreman, they are striving to do their best; or have become discouraged because they have lost interest, due to the lack of backbone or not having been trained to keep up a fast pace, no matter how long the work at hand may take!

This lack of sustained effort is particularly noticeable in pattern shops. When some of our young men are given a pattern to make that is of the variety known as "complicated core work" and calls for not only ability to make same at any cost, but to get the job finished before the moss begins to grow on it, it is a very familiar sight, indeed, to witness the tactics employed on such work. First, is the initial rush in getting out the necessary lumber. Then the dressing of same (same rush). Then the assembling (the rush wanes a trifle here). Then the carving and frequent looking over the blue print, only to find that a very serious mistake has been made. Then the ripping apart of, or the patching of either pattern or core-box (by this time the pace has very perceptibly slackened) and lastly that "what's the use" air that is akin to notice to the foremen that from that time on the pace is to be likened to that of the snail that beat the hare in the race. Not by reason of the hare taking a nap, but because the hare had tired awaiting the snail to catch up and the snail knew it; hence, there was no necessity for any undue haste on the part of the snail. I hope that by this little digression that it is made plain that there is no steam coming out of the shoes on the feet of our young men by reason of the teriffic pace they are not capable of holding to the end, and it is pitiful to record that examples of these kind of young patternmakers are altogether too plentiful in our American pattern shops today.

Let me cite another example, that of a young Finlander, not over twenty-five years of age, whose command of the English language was very limited, but whose command of sustained effort was unlimited. It was a pleasure, indeed, to watch this young man walk through any job that was given him, no matter whether it was a short or a long one, plain or complicated. He was capable of making about ninety-nine per cent. of our young patternmakers look foolish through his splendid ability, both as a patternmaker of the finest caliber and to keep up a pace that has rarely been equaled. Unfortunately he died, not because of the fast pace cut out by him in the pattern shop, but because of the very fast pace that he maintained outside of it. Let us analyze this case and see if there was any reason why this young man should so far excel young men of his own age and experience who were born in this country. First, he was compelled to serve seven years at his trade as an apprentice at very small, if any, wages. This, at least, was very good training for him, in the line of sustained effort while awaiting the day that he would actually be handed some money in quantity sufficient to keep him from eating snowballs, and when a young man can wait seven years for the time when he can call himself a mechanic, his effort at least in that direction has been long sustained, believe me.

Now, what happens to our young fellows placed in the same position? First, they cannot be induced to serve more than four years and very, very often they do not complete even this short term, when they call themselves first-class mechanics and insist upon the highest wages being paid to them. Well, you know what happens, they last as long as it takes the foreman to get on to their game, then they get another job, and the same thing happens ad infinitum, until such time as they realize that while some of the foremen can be fooled some of the time, they cannot fool all of the foremen all the time. Then the sad awakening comes, and it dawns upon their sadly muddled brains that it would have been better by far, if they had allowed themselves to be trained by a strict attention to business and for a sufficiently long time, so that they would be capable of long sustained effort on any task that may be allotted to them.

My advice to all young patternmakers is to absorb all the knowledge applying to their trade that they can comfortably crowd into the space usually not developed by an overplus of that sort of thing. And by constant practice in the shop and out of it fit themselves to tackle any job that may be handed to them in such a manner that the foreman will not get grouchy at the amount of time consumed, especially after the first rush has taken the steam out of them. To that end let me suggest that in pattern work at least the blue print be studied long enough before cutting up any lumber for the job, so that everything is clear as to just how every component part is to be made and assembled. That there need be no hesitation at any stage of the work due to not having devoted enough time in the first place to a proper

*Superintendent, National Meter Company, Brooklyn, N. Y.

understanding of the requirements. It would also be well to mention the propensity of many of our young men to consume time in "chewing the rag" to their bench mates on subjects having no bearing on their trade. To take one's mind from the work he is attempting to finish has had, to my certain knowledge, serious consequences in many cases, and has been the cause of the loss of more positions than I believe from any other known cause. It can be stated, as a matter of exact fact, that the glib-tongued individual never makes a good mechanic, hence he never makes good time on any job.

We will wind up this sermon with a few rules that will help any young man who follows them along the lines of sustained effort, and we are sure he will never be sorry he took the advice:

Shut up.

Never mind the other fellow's job—take care of your own.

Don't watch every move of the foreman, as he is paid to watch you, and he will get you in the end.

Don't offer gratuitous advice to your foreman. It does not pay.

When you have finished your job tell the foreman, don't wait for him to find it out.

Go to bed at a decent hour so that you can do a decent day's work.

Cut out all whistling and singing, as alleged music and good patternmaking do not mix.

Don't take five minutes, after the starting whistle blows, to make up your mind as to when YOU will start to work, for it is a safe bet that you don't take that long to throw off your apron when the quitting whistle blows.

Then with a clear head, an active mind, and the deepest interest in your job you will get the "sustained effort" habit down to a science.

ROLLING AND TUBE MILL PROBLEMS

AN ANSWER TO ERNEST A. LEWIS IN THE SEPTEMBER, 1912, ISSUE OF THE METAL INDUSTRY.

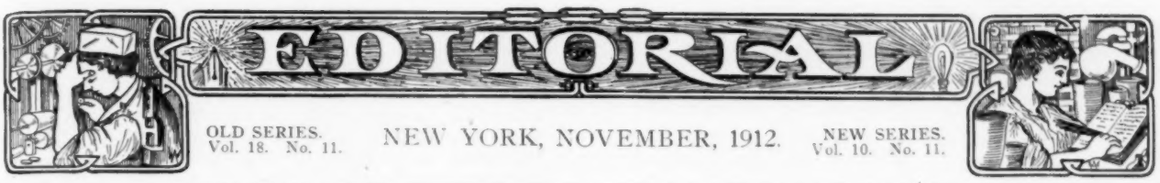
BY ROLLINGER.

I have read with considerable interest the remarks of Ernest A. Lewis under the heading "Some Questions of the Modern Rolling and Tube Mill." Unfortunately the question which he raises regarding the comparative costs of rolling brass of various mixtures is of very large dimensions, and to discuss which would require considerably more space than the editor would care to give me. It is a very difficult matter to obtain a really correct reading of the actual power taken by an engine-driven mill even of the most modern construction, owing to the comparatively small time occupied in passing the metal through the rolls, needing continuous recording over a considerable period, after which only approximate records can be ascertained. Then again it would be necessary to have an engine direct coupled to a single mill to obtain comparative records, and this is a rare occurrence. I am afraid that the actual comparisons required by Mr. Lewis will never be recorded.

The actual power required to roll the mixtures mentioned can however be accurately found by readings from a wattmeter connected to a motor driving any mill, and this I think is one of the indirect advantages in electric driving. The actual advantage gathered from electric or engine drive must be entirely one of conditions, and each case must be decided separately and in accordance with the conditions which exist. The comparisons one finds given by enthusiastic electricians are generally taken from an old fashioned steam engine plant and a modern electrical installation, which is of course misleading. Given an engine of the highest class working efficiently, it must be more economical than a motor, for obvious reasons; one invariably finds however that engines in rolling and tube mills are not working efficiently. With regard to gas engines, these have not been used with any great success for driving rolling mills owing to their inelasticity which I think is the main reason for their non-appearance in such mills. The extraordinary unequal load which is required in a rolling mill does not lend itself to a gas engine.

I am sorry that I am not in agreement with Mr. Lewis in his remarks as to the working of copper for tube making. Results prove entirely the opposite to his deductions. The latest and by far the most successful method of producing copper shells is by heating a cylindrical billet to the required heat—without burning—and passing through a piercing machine, by which method the shell is produced in approximately 30 seconds. After quenching, the shell is cold drawn in the ordinary way. The results being a concentric tube, of higher tensile strength at considerably less than half the cost of the method described by Mr. Lewis. In which method also it is necessary to heat the metal two or three times, with a greater chance of burning than in the above described one where the metal is heated only once and then in the form of a solid billet, where the outside is only liable to be burnt, and which (if it is burnt) outside is removed in the process of piercing. Again, Mr. Lewis in depreciating the piercing process says that some systems are successful on one type of copper and not on another. This I readily grant, but, a piercing machine will only deal with a good quality of metal, capable of giving the best results, a poor quality metal cannot be worked. Does it not follow that this is an enormous advantage in favor of the piercing machine? When the shell is received in the tube drawing mill, there is no further trouble. In the case of the method cited by Mr. Lewis, no doubt, he is aware of the many troubles caused by inferior metal, after it has had a lot of labor expended on it, which is pure loss, as the tube has to be scrapped, or if not, sent to a customer, which is probably even a greater loss when found out.

The cost of annealing on the various types of furnaces mentioned by Mr. Lewis would be exceedingly interesting. But in order to ascertain such costs accurately it would necessitate a furnace of similar construction in bed and fire box charged with the same capacity, in the same manner, and with the same material, and such an experiment would be extremely costly, and again I am afraid will never be made. At the same time there can be no doubt of the very great advantage to all users if this experiment could be carried out. With regard to the concluding remarks in Mr. Lewis' monograph, I think that he sums up his own queries in stating that they all have their advantages and disadvantages for different work. Not only speed and hustle are the causes of modern economies, but the necessity of detailing cost and of finding out exactly the cost of various operations, and improving upon these operations in the numerous ways open.



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THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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ECONOMIES OF THE FUTURE

The continual advance of metallurgical knowledge will lead in the near future to a complete change in the methods of brass manufacture. The small brass founder and roller will not be able to hold their own in the face of the more extensive applications of the chemist to the methods of practical manufacture. Works which are now employing their own chemist, and by chemist we mean a professional man, not a rule-of-thumb tester, find that they cannot do without him and he is becoming more and more useful in the foundry and rolling mill. The sneers of a few years ago when so-called practical men laughed at the idea of a chemist in a brass mill or foundry are things of the past. It is a wonder that the trade has existed so long without a chemist. It is a sign of progress when firms advertise for a metallurgist to take charge not only of their laboratory but also their foundry.

One of the undoubted lines along which the smaller manufacturers will economize will be by amalgamation. The day of the small manufacturer is rapidly drawing to a close. A small brass founder cannot afford to keep a chemist; he has to rely on his own good judgment. While this was doubtless very satisfactory twenty years ago, he is not so infallible now with the various patent alloys in the market; the advantages of amalgamation and the forming of one large works in place of several small ones are also evident in that large modern furnaces can be installed, taking up less room than the old-fashioned 100 or 120-pound pot fires. The quality of the metal from larger furnaces is more regular and they do not take so much fuel to melt the same quantity of metal as the small fires.

Specialization in manufacture leads to economy. One cannot economize and make every description of casting used in the engineering trade. Let one works make one descriptive type of article only, such as gas fittings, and another make valves of various kinds. With the latest type of moulding machines, the moulders would become expert at one branch, and the percentage of wasters would diminish. When small manufacturers lament the cutting of prices and underselling which is going on, let them consider all the pros and cons of amalgamation and specialization. The motor car trade is a splendid example of what can be done by specialization combined with standardization. Let the small manufacturers remember that others have amalgamated and specialized. Why cannot they do the same? A large works with modern appliances and an expert staff and one or two specialties can turn out more work and more economically than the same

amount of capital divided amongst a dozen small firms.

Another economy of the future which will have to come before long is the standardization of mixtures and sizes of sheets, etc. There are dozens of different mixtures in the market today, some of them only varying by 2 per cent. or so from well known mixtures, and yet makers have to make them, causing endless trouble in the casting shops. Gilding metal is made in several mixtures where one standard would do. Best brass sheet varies from 68 to 74 per cent. of copper instead of a standard 70 and 30 mixture. The lower grades of cold rolled brass vary anything between 62 and 66 per cent. of copper. For all practical purposes 62 and 38 mixture would be suitable. Hot rolled yellow metal cannot vary a great deal,, the best mixture contains 61.5 per cent. of copper. Of screwing metals there is no end on the market; the object of the maker is to turn out a cheap metal and sometimes 4 per cent. of lead is added. The lower grades are usually hydraulically squirted hot through a die. Why not have two standard mixtures for screwing metal, a best quality and a common one? The best, say of copper 60 per cent., zinc 38 per cent., and lead 2 per cent., and the common copper 53 per cent., zinc 43 per cent., and lead 4 per cent. If this latter mixture contains ½ per cent. iron we get a strong metal, quite good enough for common work.

Nearly every engineer has a different idea of what a good brass tube should consist of, and some of the specifications in use are quite obsolete nowadays. Is there any need for any tube mixture other than 70 and 30, 66⅔ and 33⅓, and 62 and 38, with the same mixtures with a percentage of zinc replaced by tin for marine work? German silvers are probably the most complicated in the trade. Why cannot manufacturers decide on three standard mixtures, say, "best," "medium" and "common"? It would save no end of trouble. The same remarks apply to ingot metals for recasting. Gun metals, phosphor bronzes and brass ingots could be standardized according to their different uses.

The residuals of a large works lead to a lot of unnecessary expense when they try to work them up again themselves instead of selling to the smelters after a preliminary concentration. We have no hesitation in saying that any brass works or brass rolling mill which uses up its own residuals is losing money at it. When all the incidental expenses of dirtwashing, melters and such like, to say nothing of coal, are added up, it comes to a much larger sum than is generally thought. Residuals in the future will be reduced to a minimum; brass ashes, for example, will be a thing of the past. With the newer types of furnaces there are no brass ashes to speak of, and with the successful electrical furnace there will not be any, but as we said at the beginning of this article these economies are too expensive for the small manufacturer; his only chance to hold his own is to combine, and with a larger output the economies of science, which are at the disposal of large works, will be his.

NEW BOOKS

GENERAL AND INDUSTRIAL INORGANIC CHEMISTRY. By Dr. Ettore Molinari, Professor of Industrial Chemistry to the Society for the Encouragement of Arts and Manufactures and of Merceology at the Commercial University Luigi Bocconi, at Milan, Italy. Third Revised and Amplified Italian Edition. Translated by Dr. Ernest Feilmann, B. Sc., Ph. D., F. I. C. Size, 7 by 10 inches. 704 pages, with 280 illustrations in the text. Bound in cloth. Published by P. Blakiston's Son and Company, Philadelphia, 1912. Price, $6. For sale by THE METAL INDUSTRY.

This, the third edition of a very important work has been completely revised and a number of the chapters have been considerably amplified, particularly those sections treating on cement, superphosphates, the utilization of atmospheric nitrogen, white lead, steel and water. Apart from the inclusion of various analytical methods of testing the more important chemical products, numerous patents have been cited, because, apart from the new processes or new practical successes which are often embodied in them, they always contain a new idea which tends to advance the progress of chemistry in its practical applications.

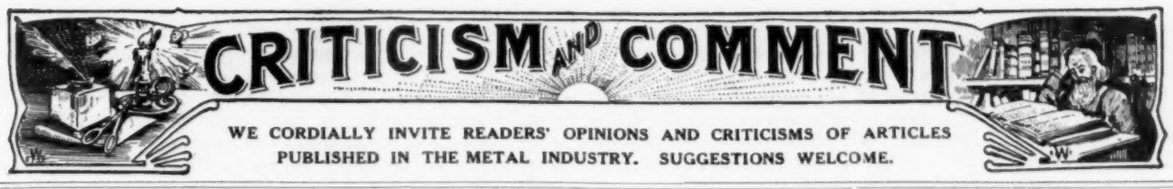
The first sections of the work are devoted to a short historical sketch of the progress of chemistry, which may perhaps be of interest to students because this branch of chemistry is ordinarily very incompletely or even incorrectly treated in other text-books. The special and systematic portion is prefaced by a theoretical portion which explains the fundamental laws. In the development of the descriptive portion, the author has often turned back to the more important fundamental laws and completed their elucidation as well as possible. Thus the exposition of the phase rule is illustrated and completed in the chapter on sulphur, and the laws of mass action are illustrated in the section on the manufacture of catalytic sulphuric acid, and are again referred to at various other points. The third portion, which deals with metals, is preceded by a section on the fundamental laws of electrochemistry and by an amplification of the electrolytic theory of solutions. The book closes with a short summary of the periodic system of the elements.

The subject-matter of which this book so ably treats is so closely allied to every day practice in every line of industrial endeavor that it cannot fail to prove of interest and value to every one, be he manufacturer, foundry-man, finisher or plater. As for example, the manufacturer should keep posted as to the chemistry of his business, the foundry-man should know all there is to know of the metals he uses, the finisher and plater should be posted about the materials he uses to obtain the beautiful finishes that he produces. This book gives all such information and certainly should be in the library of every worker in the industrial world.

SOLDERING AND BRAZING. By James F. Hobart, M. E. Size 5 by 7 inches. 190 pages with index. 62 illustrations. Bound in red cloth. Published by the D. Van Nostrand Company, New York, 1912. Price $1.00. For Sale by THE METAL INDUSTRY.

This book is a practical treatise on tools, and operations for the use of metal workers, plumbers, tinners, mechanics and manufacturers. The object that the author had in mind when he prepared this work was that it should serve as a practical aid to improved methods for soldering operations, and would thus serve the interests of mechanics who seek advancement, as well as employers who are alert to the importance of efficiency and economy in the methods pursued in their establishments.

The literature extant relating to soldering and brazing is so limited that we have no doubt but that this little work will be received with a large amount of appreciation, particularly by those who are not well versed in the mysteries of the joining of metals. The book is composed of nine chapters and gives most valuable instructions in all the various phases of soldering and brazing. There are complete chapters on the tinning of soldering coppers, solders and fluxes, soldering fluids, soldering operations, wiping joints and brazing. We particularly recommend this work to those engaged in the metal working industry.


CRITICISM AND COMMENT
WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

AMMETERS VS. VOLTMETERS

In reply to Mr. Ter Doest's criticism* on my article which appeared in the August issue, would like to say that Mr. Ter Doest evidently did not understand my meaning in this article, as my intentions were to confirm the impression that if a plater only had one instrument instead of both the voltmeter and ammeter, the voltmeter would be of more use to him for all practical purposes than the ammeter would. Taking up his proposition of adjusting the voltage, by aid of the ammeter, I cannot agree with Mr. Ter Doest that this is at all practical, but with the voltmeter it can be accomplished.

Suppose that he has 100 pieces of work in his tank and he has his voltmeter connected across the tanks showing two volts, then by removing nearly all of his work he can again adjust his voltage by means of the voltmeter and the rheostat so that he gets the same voltage; two volts across the tank. It does not matter in regard to the amperes, for if he got a satisfactory plate on his work at two volts, when he had the 100 pieces in the tank, and then removing 99 pieces he again adjusts his voltage to two volts, he would get the same satisfactory plate—on the single piece in the tank, and he would have the same amperes per piece as he had when he had the entire lot of work in the tank.

If the solution is all right and the voltage is right for the kind of work that is being plated, one can turn out satisfactory work. Of course, an ammeter will tell just the amount of current that is being used in turning out this work, but it is of no use to a plater as an aid to adjust the voltage of his dynamo or tank to do satisfactory plating. In fact, Mr. Thompson, of the United Novelty Company, in his reply in the October issue of THE METAL INDUSTRY goes after Mr. Ter Doest in much stronger language than I would care to use. I fully agree with Mr. Thompson's remarks in regard to the voltmeter and the method of using the same.

I still insist that by the aid of a voltmeter properly connected to the dynamo and to each tank, as modern voltmeters are made today, it enables the plater to adjust his voltage in the machine and also in each tank independently and thereby obtain the proper voltage for turning out the different kinds of work. Of course, the regulation in the tank is obtained by means of the rheostat in circuit with the tank, and unless there is a voltmeter with the sufficient number of terminals to permit the dynamo and tanks to be connected in this way, it is impossible to give the readings at the different tanks. The voltmeter is very valuable in modern plating, and to get along without one of these instruments today is simply turning out work by guessing.

BENNETT O'CONNELL COMPANY, S. E. Huenerfauth, Supt.

Chicago, Ill., October 26, 1912.

*THE METAL INDUSTRY, September, 1912.

TO THE EDITOR OF THE METAL INDUSTRY:

In reply to Mr. Thompson's article in the October number I am aware of the fact that I have a great deal to learn about rheostats, ammeters and voltmeters. That is the reason why I subscribe for and read THE METAL INDUSTRY. I wish further to state that evidently he did not understand my article, as I said: To show that the ammeter is the instrument to use when having only one, fill a tank full of work and place the rheostat at the proper place, note the readings of volt and ammeter; then by taking out one-half of the work it will be noted that the voltage increases while the amperage decreases. What I meant by that was to say that the current is not always in proportion to the voltage as users of the voltmeter generally believe. I was referring to those solutions more particularly where the anodes are not taken out of the tank with the work, as is the case in silver plating, and where the resistance of the circuit is consequently considerably changed.

But as Mr. Thompson has seen fit to attack me on the silver question, conceding everything he says, you can certainly do all these things with an ammeter. Besides with an ammeter one knows that for every ampere that is going through the solution for one hour, that two and one-half pennyweights, or, to be more accurate, sixty-two and one-half grains of silver, are being deposited upon the work. Can Mr. Thompson tell me how much he is depositing with one volt or would he have to go to the ammeter to find out?

H. J. TER DOEST, Foreman Plater,
Enterprise Manufacturing Company.

Akron, Ohio, October 30, 1912.

Perhaps the above letters require a little explanation. Mr. Huenerfauth is the author of the article "ELECTRICITY IN THE PLATING ROOM," published in the August number of THE METAL INDUSTRY. Mr. Ter Doest commented upon the article in the September issue. Mr. Thompson, of the United Novelty Company answered Mr. Ter Doest in the October number. Now we have Mr. Huenerfauth answering Mr. Ter Doest's first comment, and Mr. Ter Doest replies to Mr. Thompson.—Ed.

PERSELS NICKEL SALTS

TO THE EDITOR OF THE METAL INDUSTRY:

I have been in receipt of so many inquiries resulting from my recent article* in your paper in which I described some of the products of Waldberg & Company, 12-14 Rue Duret, Paris, that I believe it would be well for me to answer some of them in a general way through the columns of your paper. Most of those who inquired wished to know where "Persels salts" can be obtained, and I would advise that at the present time they cannot be obtained on this market, unless they are imported direct from Paris. I understand, however, that within the next two months there is a possibility of an American company being formed to handle all of the special and regular lines controlled by Waldberg & Company, and this will of course mean the various articles will be offered on this market within a few months, and that expert technical men will be ready to demonstrate the superiority of some of the specialties.

I note also that there is a desire for information regarding the density of the solution, voltage used and so forth, and would state that the solution is used at about 14 degs. Baumé density. It is the writer's opinion that an average commercial figure for current density used with the nickel-ammonium-sulphate solution is about 3½ amperes per square foot, while with "Persels" a current density of from 8 to 9 amperes per square foot is employed. With the solution properly made up and the proper current density being used, the voltage readings should receive no consideration, although it is obvious that in view of the high density of the solution used and the fact that it is high in conductivity, the voltage will remain low. I believe that this information will answer most of the questions that have been asked or remain unasked, and would appreciate your kindness in giving it space.

PERCY S. BROWN.

6 Harrison street, New York, October 25, 1912.

*THE METAL INDUSTRY, October, 1912.

A BUFFALO CONVENTION ECHO

TO THE EDITOR OF THE METAL INDUSTRY:

In reply to the questions that you put forth at the foundrymen's exhibition at Buffalo, N. Y., I have to make the following remarks:

Your first question—"Do you consider exhibiting good advertising for your products?" You will note that I am replying to your question concerning specific products, meaning the products of my own manufacture, which is that of foundry facings, etc.

Foundry facings, no matter by whom made, look very much alike, and on casual examination, such as occurs at foundrymen's conventions, it is not probable that the merit, or lack of merit would be determined. A mere exhibit therefore, of such material, under such conditions, I do not regard of any particular value, and from such an exhibit I would not expect to make any sales. I ought to, perhaps, add that anything that causes "publicity" is good, and whether as good as or better than some other method, depends, of course, upon comparative costs.

Answering your second question, "Do the results of this year's exhibition warrant your taking space next year?" I may reply, I see no reason why I should not take similar space another year.

Answering your third question, "Do you think it is to the interest of the convention to have still or moving exhibits?" I regard moving exhibits, meaning machinery, etc., as being the most productive of results, because at a convention a buyer may see machinery in actual operation which he perhaps would not see at a factory, where such machinery is made, and especially would it become necessary for him to make a trip for that purpose, which very likely he would not make, and which he can readily see at a convention; therefore, the moving exhibits become an attractive feature, and doubtless, one which brings orders to the manufacturer. It seems to me, therefore, that the convention should encourage both "still and moving exhibits."

FREDERIC B. STEVENS.

Detroit, Mich., October 14, 1912.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY

ALLOYING

Q.—We would like to have a bronze mixture to withstand the action of a solution of muriatic acid and water.

A.—Most of the high lead acid metals are deficient in strength. Gun metal (copper, 88; tin, 10; zinc, 2) resists acid well. If you are able to obtain a fine grain by chilling or otherwise. We have seen Parsons manganese bronze used very successfully for pickling frames, etc. Muriatic acid will attack it but slowly, and it has great strength and good casting qualities.—J. L. J.

Q.—I am making small brass castings for grain drills, using an alloy of copper, 20; good scrap brass, such as old valves, 20; tin, 1½. My castings have always stood up, but I would like to know if there is any way by which I could improve their strength.

A.—Increasing the copper and tin in your mixture will make it stronger and stiffer. Assuming that your scrap runs 76 copper, 18 zinc, 3 lead and 3 tin, the mixture you mention would give the following percentages: copper, 84.83; zinc, 8.67; lead, 1.44; tin, 5.06. By using 27½ copper, 20 scrap brass, and 2½ tin, your mixture becomes copper, 85.40; zinc, 7.20; lead, 1.20; tin, 6.20. Decreasing the scrap and increasing the tin even more you get about an 88-10-2 mix, which will give even a better metal.—J. L. J.

ANNEALING

Q.—Please inform me how to anneal high speed steel as we have tried several processes but do not get same soft enough to give satisfaction and work same into forming tools.

A.—To anneal high speed steel and get same soft, place in a furnace (preferably a gas furnace) and heat to a full red heat or about 750 degs. Cent. (1382 Fahr.) and cool slowly in the air. When cool again place in the furnace and when it has reached 750 degs. hold the fire steady for thirty minutes, then allow to cool as before. When cool it will be found to be soft and easily machined.—P. W. B.

BRAZING

Q.—Please advise us through the Shop Problems what is the best flux for brazing sheet brass. We have been using borax but the results are that after brazing it leaves a red, hard, scaly substance. How can we overcome this trouble?

A.—The best material to use for brazing sheet brass is fused on burnt borax, reduced to a fine powder and then mixed with pulverized brazing metal, similar to your present application. It is impossible to overcome the red, hard, scaly substance. This is what protects the metal from oxidation and is due to the borax melting at a lower temperature and combining with a little of the oxide of the metal and producing a glass or vitreous surface. You can dissolve this readily by immersing in a warm pickle solution, consisting of oil of vitriol one to two parts and water eight to ten parts, or hydrofluoric acid two parts and water eight parts. This is the natural solvent for such surfaces, or sand or silicates from the surface of cast metals. The hydrofluoric acid must only be contained in a receptacle of wood lined with asphaltum or lead. After pickling the articles should be acid dipped to bring up the natural color of the brass. Use the following dip:

Aqua Fortis—38%	1 gal.
Sulphuric acid—66%	1 gal.
Water	1 qt.
Muriatic acid	2 ozs.

The articles should afterwards be washed well in cold water and dried.—C. H. P.

CASTING

Q.—I would thank you to kindly give me the following information: (1) What flux to use for German silver casting, as I am having some trouble with some cylinders. They are about 20 inches long, 4 inches diameter, 3/16 inch thick. This is the mixture that I am using: Copper 50 per cent., Nickel 20 per cent., Spelter 28 per cent., Lead 2 per cent. (2) A mixture of white metal to take a good polish and stand 100 pounds working pressure, to be cheaper than German silver, with not more than 2 per cent lead. (3) A mixture for copper castings to stand about 3,000 degrees Centigrade of heat, the copper to be not less than 9 per cent.

A.—(1) The addition of four ounces of 30 per cent. manganese copper and the same amount of aluminum to your cylinder mixture ought to improve its casting qualities. (2) A white bronze that has been recommended as a good substitute for German silver is the following:

Aluminum	1.50
Copper	63.50.
Manganese	20.00
Zinc	15.00

(3) As copper melts at 1084 degrees Centigrade, it is evident that nothing could be added to it that would raise its melting point to 3,000 degrees Centigrade.—J. L. J.

CLEANING

Q.—Kindly tell us how to overcome the oxide on old silver-plated ware. We have a good deal of trouble in taking off this oxide before plating.

A.—The oxide so termed is a silver sulphide and can be readily dissolved by immersing in a ten per cent. solution of cyanide of potassium used at a temperature of 160 degrees for a few moments. If the coating is an oxide of tin or lead sulphide, an immersion for a few seconds in a concentrated solution of muriatic acid will remove the black coating. The articles should then be cleansed in the regular manner before plating.—C. H. P.

ELECTROTYPING

Q.—Would you kindly give me the solution for making copper electrotypes?

A.—The composition of electrotyping solutions varies considerably without affecting the deposit. The formula commonly used is to dissolve sulphate of copper in water until a density of 18 degrees Baume is reached; and then add from 1½ to 2 ounces of sulphuric acid to each gallon of solution. To produce a very ductile copper deposit, one-half ounce of common black molasses should be added to every ten gallons of solution. The voltage for such a bath should be from three quarters to one and one-half volts.—C. H. P.

GILDING

Q.—An English subscriber asks "What is the advantage of using phosphate of soda in gilding solutions?"

A.—Phosphate of soda is used very extensively in the United States as an addition to gilding solutions, especially when a clear yellow color is desired in preference to an orange or reddish tone. The amount added to a gallon varies from one to eight ounces.—C. H. P.

MOLDING

Q.—Will you please inform us what substitute for bean flour can be used for dressing odd side molds?

A.—Would suggest that you try Bull Run talcum powder, which may be had from any dealer in brass foundry supplies in the United States.—J. L. J.

OXIDIZING

Q.—What is the best method of oxidizing bronze, giving it a statuary bronze color? The size of the pieces are 7 by 2 by 2 feet. We want to do this without using a tank.

A.—To produce a statuary bronze finish on bronze articles without the customary immersion you will have to use what is termed the sponging method. Cleanse the surface by applying a solution of sodium carbonate in water; then wash the surface and apply a dilute solution of cyanide of potassium in water (about 2 ounces to the gallon). These operations can be done by using a fairly good sized sponge. Now prepare a fairly concentrated solution of liver of sulphur or sulphide of barium, using about 4 ounces of either to a gallon of water. Apply a little at a time to a sponge and go over the surface to be colored as quickly as possible. Then rewash carefully and rub down, wet or dry with finely sifted sea sand, which will bring up the color and give sufficient relief to the surface. Afterwards dry well and brush lacquer.—C. H. P.

PLATING

Q.—You use many American names in your articles on plating with which English readers are not familiar and I for one would like to be enlightened as to the meaning of tampico wheels, Kayle solution and the prefix sal.

A.—Tampico wheels are used for scouring metals mechanically instead of using bristle wheels. Tampico consists of a vegetable fibre obtained in Tampico, Mexico and certain sections of South America. Kayle is a cleaning compound consisting of alkalies and rosins and is used largely in the United States for cleaning polished metals previously to plating. The term "sal" is a common prefix used in America, viz.: sal soda for carbonate of soda or washing soda; sal ammonia for muriate of ammonia (chloride of ammonia).—C. H. P.

Q.—We have a quantity of metal dish covers to nickel plate, but owing to the tin being off in places they look patchy after plating and mopping. Can you tell us what to do to make them practically like new?

A.—The patchy appearance of your dish covers is due to the unevenness of the surface, owing to the tin being worn off. The simplest method to overcome this and produce a satisfactory nickel deposit would be to copper plate the articles for a short time and then give them a light buffing or mopping and finally nickel plate. The articles, of course, could be retinned, but this would require an experienced man, and if you have a copper solution the method mentioned would be the simplest.—C. H. P.

RECOVERING

Q.—Would you kindly inform us which is the best and most economical way of reducing lead dross; also what type of furnace is best? Our lead dross is in a finely divided state and contains a good percentage of lead to be recovered.

A.—You can recover considerable lead by a simple sweating operation. The residue of oxide of lead, etc., should be smelted in a reverberatory furnace using hard coal as a reducing agent.—J. L. J.

RUST-PROOFING

Q.—I would very much like to have the formula for the black coating on the sample shaft I am sending you. My method is to copper plate and then dip in sulphide of ammonia, but this does not prove very satisfactory.

A.—The sample shaft was probably coated by the Coslettizing process. This method consists of boiling the articles in a solution made up from water, phosphoric acid, phosphate of iron and zinc dust. The proportions have frequently been given in THE METAL INDUSTRY. The process is patented and the formula is used on a royalty basis. A solution made up as follows might answer your purpose: Dissolve in each gallon of muriatic acid by heat, 2 pounds of powdered white arsenic; then add 1 quart of water to which is added 2 ounces of sulphate of nickel and 4 ounces of sulphate of copper, and mix the solution to the acid. Use this solution near a good draft as the fumes are not very pleasant. Anodes of nickel should be used as long as a good black deposit is obtained. If the deposit becomes too bright, change to copper anodes for a short time. Use a current of from 1½ to 2 volts. It is advisable to give the articles a light flash previously in a nickel or copper bath.—C. H. P.

STRIKING

Q.—My striking solution does not give off gas freely, in fact large articles will not give off any gas but will plate very slowly, and when I hang the work in the bath it will raise and peel in scratch brushing. Can you suggest a remedy?

A.—Your solution appears to be too inactive for a strike, which is due to an excess of potassium carbonate or the solution is too concentrated with metal. We would advise you to reduce its present density to one-half with clean, cold water; then add from 4 to 8 ounces of cyanide to each gallon and one ounce of ammonia (20 per cent.) to every ten gallons. If your current passes through the solution and does not short circuit this addition should overcome your trouble.—C. H. P.

THREADING

Q.—We are having considerable trouble with our threading chasers, tearing off and stripping the threads when we change from cast brass to thread brass tubing, using the same die-head and chasers. Have used lard oil as a lubricant but it does not overcome the difficulty.

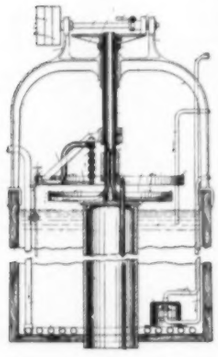
A.—On metal such as cast red or yellow brass all chasers or threading dies if ground parallel on the cutting edges will usually give satisfactory results but for all soft clingy metals, such as brass tubing or pipe and soft drawn brass, which are so soft and stringy as to have a tendency to tear when threaded, it is always desirable to grind the chasers or dies with a hook shape, and whether the hook should be slight or pronounced must depend altogether on the nature of the metal. If very soft a more pronounced hook shape on the cutting edges of the dies would be necessary than for metal that is moderately soft, and the correct amount of hook necessary must be determined by the quality of the metal to be operated upon.—P. W. B.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

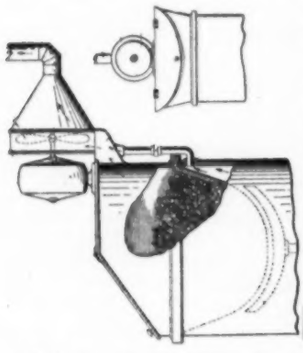
1,036,571. August 27, 1912. ELECTRODEPOSITION OF METALS. James Albert Corey, of Datchet, England.

This invention relates to apparatus for electro-depositing metals and more particularly to apparatus for the production of printers' electrotypes for use with high-current densities of the kind in which there is mounted within a circular vat an annular negative electrode which is rotated for the movement of the cathode in the electrolyte, and the invention has for its object to provide an apparatus of improved construction adapted to work economically with high-current densities and whose operation is simple, convenient and effective; and the invention comprises an improved construction and arrangement of the cathode and anode carriers as shown in cut, and means for passing current therethrough, and for rotating the cathode; also an improved mold or plate holder by which good contact with the cathode carrier is always insured; and improved means for filtering and maintaining constant the strength of the electrolyte without the necessity of interrupting the working of the apparatus.



1,036,853. August 27, 1912. ATTACHMENT FOR MELTING FURNACES. Robert T. Johnston, of Scotch Plains, N. J. Assignor, by mesne assignments, to Automatic Furnace Co., of New York, N. Y., a corporation of New York.

This invention relates to a melting furnace capable of general use, but especially adapted for melting type metal and the like.



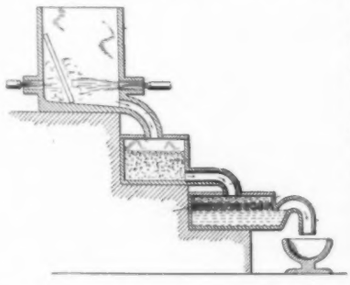
As at present constructed, the melting furnaces which are used for re-casting into ingot form the type and slugs made by monotype and linotype machines after the same are used, are open to serious objections. The present practice is to heat a melting furnace full of this material and then to reduce it. In order to provide the melting pot with a complete charge it has to be filled to overflowing with type and slugs, and even then when it is melted down it will be found very often to be 25 per cent. short of the full charge of clear metal. It is not desirable to open the furnace and throw in additional material, as this requires that the extra material be stored in some convenient place, and when the furnace is opened it gives off fumes and soot from the burning carbon, dirt and sweepings in the furnace which get into the room and cause considerable trouble, not only from the dirt that is deposited, but also on account of the obnoxious and poisonous character of the fumes generated by the lead and antimony. A simple, compact and convenient arrangement for overcoming these objections is provided by this invention in the form of an inclosed hopper, as shown in cut, for receiving a part of the charge and holding it until it can be melted down into the melting pot, and for receiving the gases and fumes from the melting pot and products of combustion from the burner and directing them into a chimney, or the like. This is provided with a passage connected with a fan casing mounted and supported on the hopper from which the air currents are directed outside the room in which the furnace is located, as for instance up a chimney or stack. The fan also takes the products of combustion, smoke, etc., from the burner through a conduit extending from the upper part of the furnace and connected with the fan casing.

1,037,234. September 3, 1912. BRAZING COMPOUND. Jay Dill Ge Brott, Onalaska, Kans.

This invention relates to a new and useful composition of matter to be used for brazing band saws, silver and tinware and any other metals capable of being brazed together. The improved composition consists of the following ingredients combined in the proportions stated, viz:—pure muriatic acid, 8 oz.; zinc in such quantities as will be dissolved by the acid, which is about four (4) ounces; pure rain water, one pint; sal ammoniac, 3 oz.; powdered rosin, 3 oz.; cochineal, 1 oz. These ingredients are thoroughly mixed by agitation and are then strained through absorbent cotton until all sediment is removed, making a liquid which is absolutely free from grit, dirt and all foreign matter.

1,037,538. September 3, 1912. PROCESS OF REFINING COPPER. Walter S. Rockey and Hilliary Eldridge, of New York, N. Y. Assignors to Metallurgical Research Company, a corporation of Arizona.

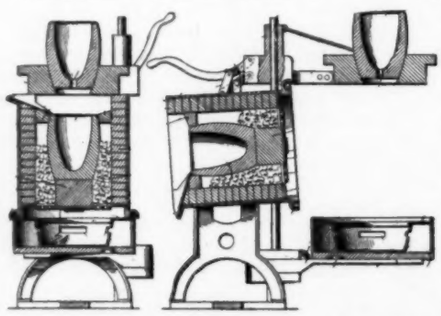
This invention relates to the purification and refining of copper, particularly cathode copper, and the object of our invention is to provide a process of refining copper. In carrying out the process the copper is fused by exposing it to the direct heat of a furnace, so as to melt the copper as rapidly as possible regardless of its contamination by the furnace gases and the atmosphere, and to remove said contamination afterward by flowing the copper before casting into intimate contact with carbon, and preferably first into carbon and then into and through and under a suitable flux, such as a flux of anhydrous boron trioxid (B_2O_3) or one containing anhydrous boron trioxid, any of which fluxes should also preferably contain carbon, and afterward leading the copper into suitable molds or a ladle.



In carrying out the process there is first provided a suitable melting furnace, such as a fuel-oil blast furnace, which is provided with the usual metal-charging orifice and an outlet for the molten metal, as shown in the cut.

1,037,768. September 3, 1912. MELTING FURNACE. William Joseph Holzapfel, Eddystone, Pa.

The present invention relates to certain new and useful improvements in furnaces of that general type which are employed for melting brass and other metals, the primary object of the invention being the provision of a melting furnace, as shown in the cut, which embodies novel features of construction whereby the furnace body and other



parts associated therewith can be easily and quickly manipulated as may be found necessary in the operation of the furnace.

A further object of the invention is the provision of a tiltable melting furnace including a detachable air feeding base adapted to move with the furnace body when the latter is tilted to pour out the contents of the crucible contained therein. A still further object of the invention is the provision of a melting furnace including a movable base and top for the furnace body, and novel lifting mechanism for bringing the said top and base into and out of engagement with the furnace body.

1,037,887. September 10, 1912. PROCESS OF PLATING METALS. Milton W. Franklin, Schenectady, New York. Assignor to General Electric Company, a corporation of New York.

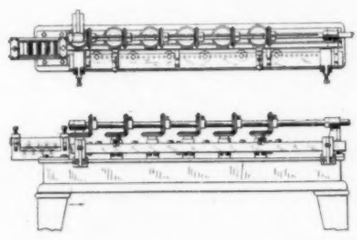
This invention comprises a process for electrolytically coating non-conducting surfaces with metal. The method formerly in use for coating non-conducting material, such as glass, with metal consists in first covering the material to be coated with a varnish, such as copal or shellac. The varnish furnished a sticky surface which was coated with graphite, and was then made the cathode in a plating bath. In the finished product the metal film is attached to the glass, or other vitreous surface only by means of the varnish, which renders the articles thus plated unfit for use at high temperatures. Even at ordinary room temperature the metal coating can be easily peeled off.

The inventor has discovered that when the non-conducting surface is coated with an adhesive which is permeable, and preferably also soluble, in the plating electrolyte, and a conducting layer is applied as usual, the plated film adheres very firmly to the surface upon which it is applied. To render the film of adhesive conducting, he prefers to use, in a finely divided state, the metal to be plated, or a metal with which it will readily unite and incorporate the same, as by rubbing, into the adhesive film. During the plating process, metal is deposited on all sides of each particle.

As a suitable material for the adhesive coating may be mentioned gum arabic, fish glue, water shellac, gum dammar or gum tragacanth. An aqueous, or other suitable solution of the gum is applied in a very thin layer upon the non-conducting surface to be coated. The surface is sprinkled with a very fine powder of metal, preferably of the metal to be plated, for example, copper. The copper powder is then rubbed into the film of adhesive. When the surface thus prepared is plated in the ordinary way, each grain of the original metal powder is coated with metal and the minute quantity of adhesive is practically dissolved out, leaving a coating of pure metal. If any portion of the adhesive remains, it is probably incorporated with the metal.

1,042,131. October 22, 1912. METAL STRAIGHTENING MACHINE. Sylvams D. Locke, Bridgeport, Conn.

This invention relates to machines for straightening wire, rods, bars and plates by means of sets of straightening elements placed in staggered relation, as shown by the cut.

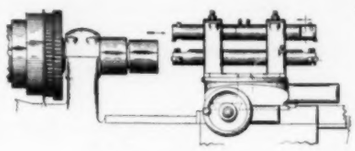


It is one of the objects of the invention to produce a metal straightening machine in which one set of straightening elements is adjustable in a group toward and from the other set. A further object of the invention is to produce a metal straightening machine in which means shall be provided for indicating the variation of the work from a right line.

A further object of the invention is to produce a metal straightening machine in which the straightening elements have independent longitudinal adjustment. A further object of the invention is to produce a metal straightening machine in which feeding mechanism may be dispensed with and the work carried through by the operation of the machine itself, so that the piece of work operated upon is straightened from end to end.

1,041,994. October 22, 1912. ATTACHMENT FOR TURRET-LATHES. Clarence L. Goodrich, of Hartford, Conn., assignor to Pratt & Whitney Company, of Hartford, Conn.

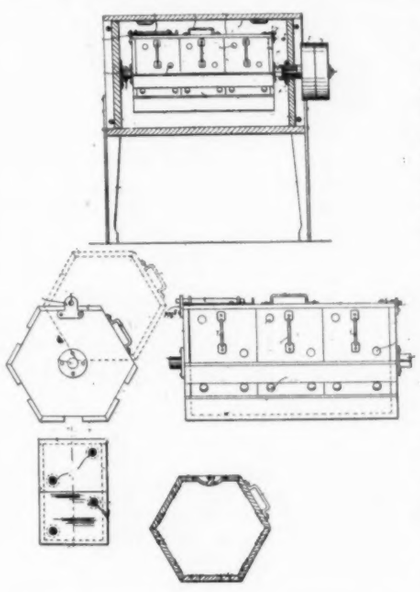
The object of the invention is to provide a device whereby tubular or hollow articles of various kinds can be turned interiorly and exteriorly with facility and accuracy.



What is claimed for the device, as shown in cut, is covered by the following claim:

The combination of a tool carrier, and a support for said tool carrier, the latter having means at its opposite ends for supporting tools and also comprising two axially alined tool carrying sections, each of which is carried by said support for movement about its axis, and while carried by said support, said sections being jointed to each other between the tool carrying ends, and means for preventing relative movement of said sections during work.

1,038,791. September 17, 1912. TUMBLING AND POLISHING MACHINE. Henry B. Richardson, Attleboro, Mass.

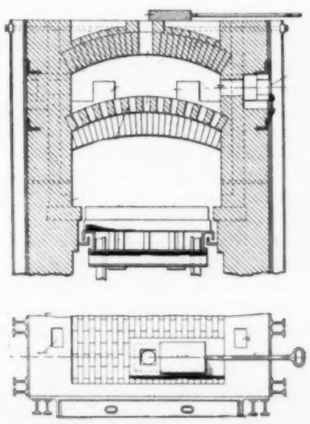


This patent covers an improvement in tumbling and polishing machines used for polishing or burnishing various articles of metal, as jewelry novelties, optical goods, etc. What is claimed by the inventor of this machine is as follows:

The combination with a liquid tank, of an elongated polygonal-shaped hollow frame, a cover-protected opening communicating with the frame's interior, means for revolving the frame, a plurality of containers slidably fitting, transversely, the said frame, a main or charging opening formed in each container arranged to register with that of the frame, a cover element for each container, and means for removably securing the covers in position against accidental opening.

1,030,801. October 1, 1912. FURNACE. Wirt S. Quigley, Rockaway Park, N. Y.

This invention covers the combination of an over-fired furnace as shown in cut, having a heating chamber and a combustion chamber above the heating chamber, in free communication therewith, of means for controlling the heat of such furnaces comprising a regulating relief passage in the top of the combustion chamber which may be partially or wholly opened, and which when so opened is arranged to permit the escape of the heat from the combustion chamber without passing into or through the heating chamber, the relief passage being independent of the means of escape normally afforded by the exit flues, with which the heating chamber is provided.



INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

SYSTEM FOR METAL RECOVERY

The American Concentrator Company, of Joplin, Mo., are introducing a simple system for the recovery of the metal contents of brass ashes, sweepings and other refuse of metal plants. This system, which is shown in the sketch, is described by them as follows:

A bin No. 1 should be provided to receive this material, which should be broken up to a size which can be fed to rolls No. 3, and all the course chunks of metal should be handpicked from the cinder before it is placed in bin No. 1. If this bin is covered with a grizzly and the cinders dumped on this grizzly and broken up so that they will pass through it with sledge hammer, the coarse metal can be recovered and the material can be prepared for final crushing.

No. 2 is a gate controlling the flow of the material from the bin to the rolls No. 3. These rolls should crush the material to ¼ inch and finer. From the rolls the material passes to elevator No. 4, which conveys it high enough to discharge on one of our two-compartment jigging machines. This machine is of the standard Hartz type equipped with our fast motion irons, and makes a most perfect separation between the cinder and the metal. Like all jigging machines, it is operated by forcing water in pulsating strokes up through the bed of the material resting on the sieve of the jig. The metal will settle to these sieves and the tailings or cinders will overflow into tank No. 6, with the jigging water. Very fine metal will go through the sieve of the first compartment into the hutch of the jig. This, together with the metal removed from the top of the sieve of the first compartment will be very clean and the second compartment is used as a guarantee that the tailings will be practically free of clean metal, and the product of this compartment is returned to the elevator for retreatment.

The cinders which overflow into box No. 6 can either be hand shoveled from this box or a slow moving dewatering elevator can be erected in it, which will remove the cinder in a dewatered condition and elevate it high enough to be discharged into a bin, under which a wagon can be placed and the cinder withdrawn and removed to any convenient point of disposal. The overflow water from No. 6 passes directly to a small box or tank, to the side of which the suction of a small centrifugal pump is attached. This pump discharged the water again on to the plungers of jig 5, hence the only fresh water required is that which will be represented by the water removed with the dewatered tailings and the brass.

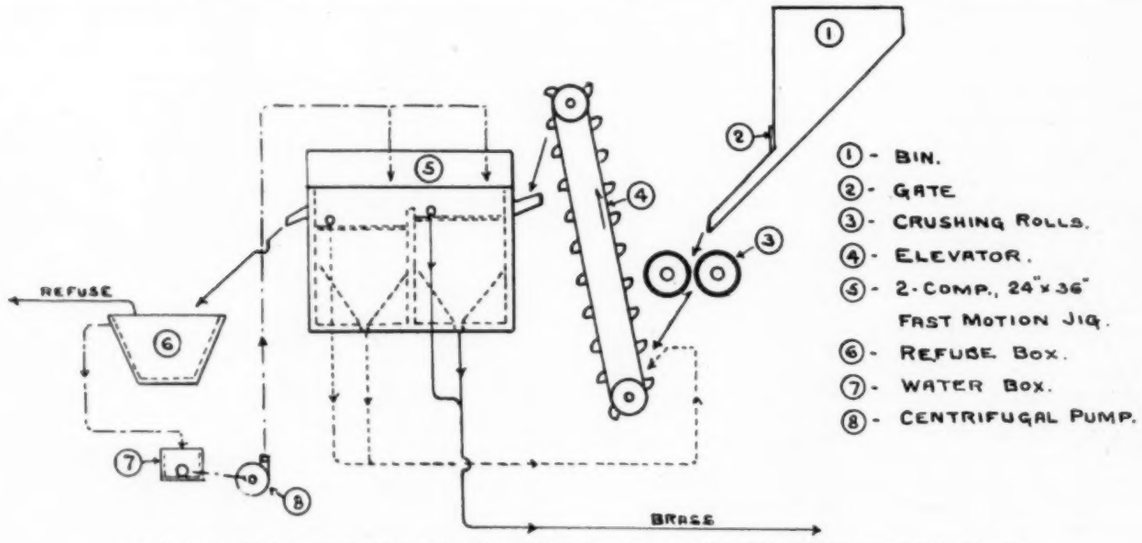
Different conditions require different installation, the equipment for a system as described above would consist of:

One set of 16 x 10 inch New Century geared crushing rolls with steel tires.

One two-compartment 24 inch x 36 inch Hartz type jig equipped with fast motion, all complete.

One 1½ inch Centrifugal pump, brass fitted, pulley driven, type "A," single stage.

One belt and bucket elevator, having 8 inch cups and 15 foot centers, complete with head shaft, bearings, collars, pulleys, adjustable take-up for bottom shaft, bottom shaft with pulley, collars, and including belt and cups. The necessary drawings or sketches adapting this equipment to meet local conditions. The price of the above f. o. b. Joplin would be $626. Estimated weight, 8,000 lbs. These systems have already been installed in some of the largest works in the country, among them being the plant of the Lunkenheimer Company, Cincinnati, Ohio; Crane Valve Company, Bridgeport, Conn.; the Ajax Company, Philadelphia, Pa.



A TYPICAL INSTALLATION FOR THE RECOVERY OF METAL CONTENTS FROM FOUNDRY WASTE.

PAX-OIL AND ROS-CORE

J. W. Paxson Company, Philadelphia, Pa., have recently put upon the market two compounds for use in making cores which the company report as meeting with remarkable success. The first of these compounds is called Pax-Oil and is used in machine made cores. Pax-Oil is claimed to be chemically prepared to meet the requirements of foundry core room practice and is said to possess all the advantages of rosin and the economies of core oils with the additional advantage that it will prevent the absorption of moisture. Some of the advantages of Pax-Oil are claimed to be:

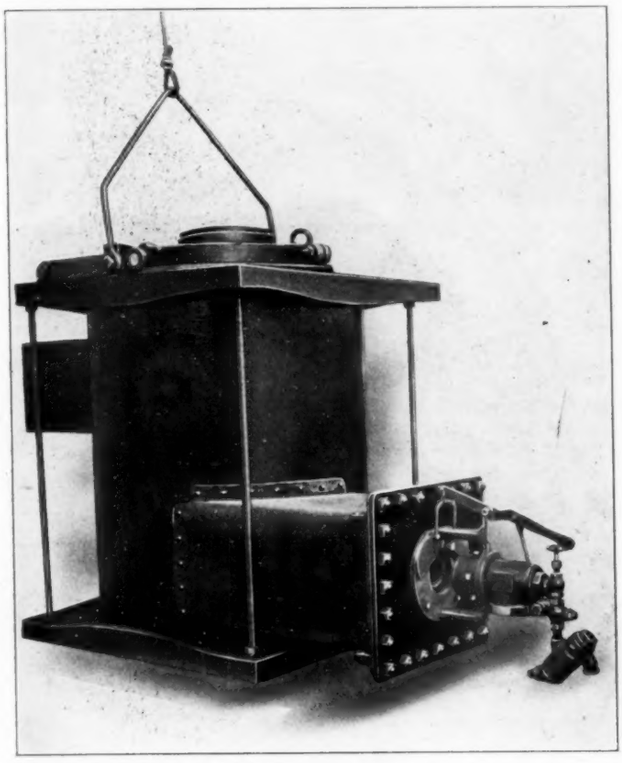
Lower in price than any like liquid.
Saves labor of powdering rosin.
Emits only one-third as much smoke as powdered rosin.
Insures against blows.
The cores *will not* draw moisture.
The oil will mix with water.
Will not hurt the hands while using it.

Ros-Core, the second product is a liquid and is chemically prepared to make large cores. It is claimed to be more economical than flour, pitch, molasses or like core binders, and that it will not absorb moisture. It is used for general foundry work where cores are made of gravel or from sands which contain bond. Some of its advantages:

Has greater strength.
Lower in price.
Insures against blows.
Makes hard cores, but they are porous.
Makes very little smoke.
Will not hurt the hands.

ANTHONY CRUCIBLE FURNACE

The furnace shown in the accompanying cut has been greatly improved over the one that was described in the June, 1910, issue of THE METAL INDUSTRY. The distance of the burner from the interior of the furnace has been increased by the interposing of a mixing or combustion chamber as will be seen in the cut. This



THE ANTHONY CRUCIBLE FURNACE.

feature ensures a more complete combustion and prevents the crucible from getting the harsh blast from the fuel, and therefore its life is greatly prolonged. Another improvement in this furnace lies in the formation of the cover, which is hinged directly to the top plate in such a manner that when opened the top or cool side is always turned towards the operator. It is counterweighted so that very little effort is required for its operation, and when opened is entirely within the outside lines of the furnace plate. Ample provision is made for spilled metal or broken crucible by leaving out a section of one grate bar, and also a hole in the fire brick bottom of the furnace directly over this section. A light tap with a bar applied through the top of the furnace will break through a plug in this hole and the metal may be run if desired directly into pig molds arranged for the purpose.

The burner used in this furnace is known as the Anthony "Nebulite" Low Pressure Burner, using air at a pressure of six ounces from a fan blast. The oil is atomized mechanically by pump pressure only which delivers it from the burner tip as an extremely fine mist or steam; or compressed air is used as an atomizing medium. The burner is almost noiseless in its operation and is controlled by a single lever which regulates both oil and air with one motion. Some of the results of tests made with the Anthony furnace are given below. These tests were made with an equipment of ten furnaces, which were in continuous operation for nine hours daily, starting at 7.30 a. m.:

JULY, 1912.

Total heats	1,562
Total metal poured	341,215 lbs.
Total melting loss	1%
Oil consumed per 100 lbs	2.92 gals.
Average time of heats	1 hr. 1 min.
Average heats per crucible	41.9
Size of crucibles	No. 80
Composition of metal	Red brass 75% to 86% copper ingots
Oil pressure at burner	45 lbs.
Air pressure at burner	5 to 6 ozs.

AUGUST, 1912.

Total heats	1,933
Total metal poured	445,442 lbs.
Total melting loss	1%
Oil consumed per 100 lbs	3.01 gals.
Average time of heats	1 hr. 1 min.
Average heats per crucible	43.2
Size of crucibles	No. 80
Composition of metal	Red brass 75% to 86% copper ingots
Oil pressure at burner	45 lbs.
Air pressure at burner	5 to 6 ozs.

A report from a large western foundry showed a shrinkage for 19 heats of 125 pounds each out of a No. 40 pot of yellow brass (70 per cent.) averaged just under 2 per cent. on the total melt, some of the results showing as low as 1¼ per cent. loss.

These furnaces are manufactured by the Anthony Company, Long Island City, N. Y.

NEUTROL. C. P. BARIUM CYANIDE 20½%

By S. SHOELD.*

When a cyanide solution stands in the air it slowly decomposes by the action of the carbon dioxide into carbonate and free hydrocyanic acid, of which the latter evaporates. The cyanide content of the bath will thus decrease and it has to be replenished. This is generally done by putting in potassium cyanide in the bath once in a while; one or two ounces per gallon. (Using hydrocyanic acid for the purpose is absolutely useless, because the hydrocyanic acid cannot decompose the potassium carbonate.) By the use of potassium cyanide the bath will accumulate carbonate and the gravity of the bath will increase. As a matter of fact, the higher the amount of carbonate in the bath, the higher must be kept the amount of free cyanide. That is, to cover up the action of the carbonate the amount of free cyanide in the bath must be increased. The conductivity of the potassium carbonate is further considerably lower than that of potassium cyanide.

The most ideal method for correcting the cyanide content of the bath is by the use of barium cyanide. It will react according to the following formula:

$$K_2CO_3 + Ba(CN)_2 = 2\,KCN + BaCO_3$$

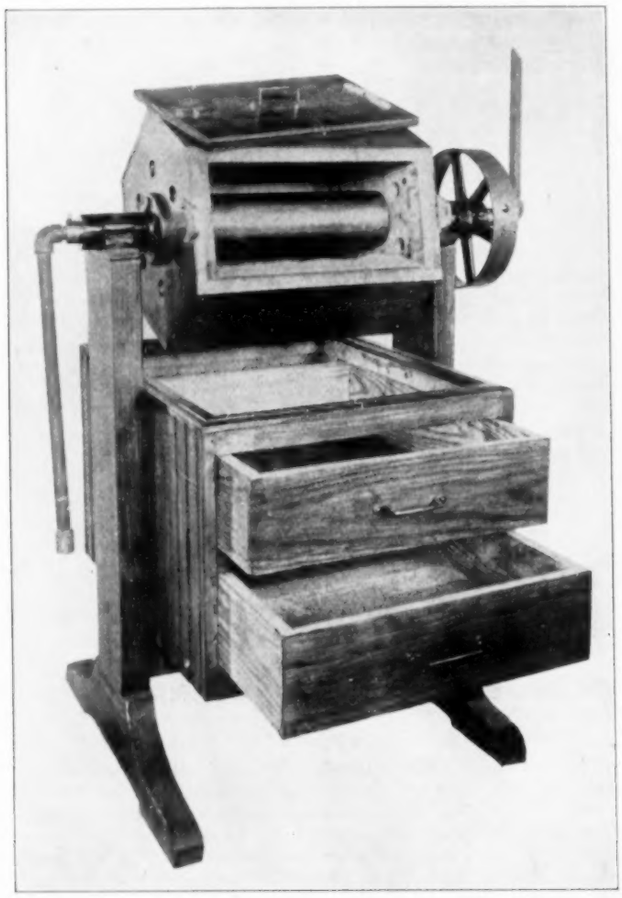
or potassium carbonate + barium cyanide = potassium cyanide + barium carbonate (insoluble).

The insoluble barium carbonate separates out and the only action of the barium cyanide upon the bath is, that it converts the potassium carbonate back into potassium cyanide, *without introducing any foreign substance whatever in the bath.* By the use of barium cyanide two or three times a year one can keep a bath constant in composition and gravity practically forever. The barium cyanide is especially suitable for silver baths and gold baths (in case the latter do not contain phosphates.) Any information regarding barium cyanide and the use thereof to those interested will be furnished by the William Berkel Chemical Works, 683-85 Communipaw avenue, Jersey City, N. J.

* Chemical Engineer, William Berkel Chemical Works, Jersey City, N. J.

JEWELRY DRYING-OUT MACHINE

The machine shown in cut has just been invented by H. B. Richardson, of Smith & Richardson, Attleboro, Mass., and is now ready for the market. This machine (patent pending) is intended for the drying-out of jewelry and small metal parts. This machine dries out the metal pieces instantaneously without leaving any spots or tarnish, and can be operated by a



THE RICHARDSON JEWELRY DRYING-OUT MACHINE (PATENT PENDING).

boy. The machine has a steam drum inside the barrel, which with the sawdust kept hot by this drum, dries out the metal instantly. After taking off the cover the barrel is turned over and the contents drop into the sieve below, then the sawdust drops into the drawer. The sawdust is returned to the barrel and it is ready for another batch.

A NEW METAL SLITTER

A metal slitter, designed with the primary object of changing cutters in minimum time, has recently been placed upon the market by the Blake & Johnson Company, of Waterbury, Conn. The machine is shown in the cut, which is taken from photographs of the same machine made without moving the camera. The machine was not disturbed except to move the out-board housing and to raise the upper arbor or changing cutters.

The upper arbor is hinged on an intermediate shaft and is adjustable to and from the lower arbor on an arc rather than a straight line. This upper arbor is driven by a bronze gear on an intermediate shaft which is in mesh with a steel gear on the arbor, so whether the cutters are five and one-quarter inch diameter, as when new, or four and one-half, when worn there is no lost motion in the drive—all gears run on their true pitch line at all times. In order to change the gangs of cutters it is only necessary to remove two cap screws at foot of out-board housing. Slide the housing clear of the arbor-ends, release lock-pin and adjusting screw, and swing the upper arbor up and away from lower arbor as in Fig. 2. This ease of operation in changing cutters appeals in particular to those whose output varies in widths of stock.

The following are the specifications for a six inch machine:

Diameter of cutters	4½ to 5¼ inches
Size of pulley (friction-clutch)	16 x 4 inches
Back geared	4.2 to 1
Floor space	25 x 53 inches
Net weight	1,100 pounds
Diameter cutter arbors (can be changed)	2⅝ inches
Distance, floor to center line, lower shaft	38½ inches

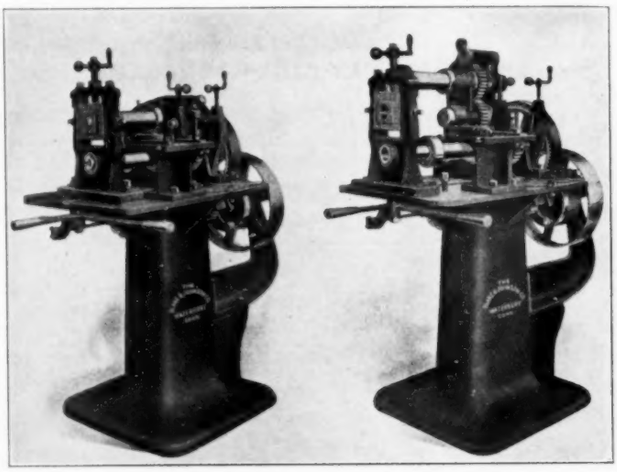
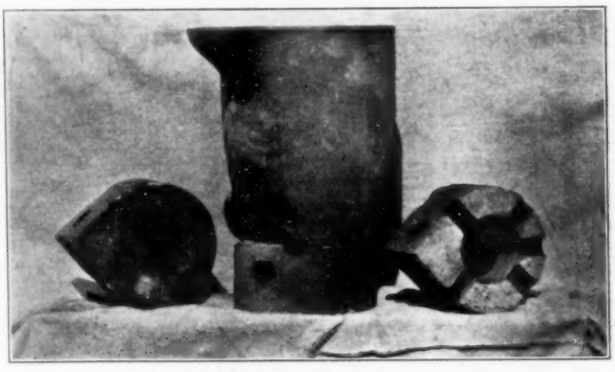


FIG. 1. Ready to operate. FIG. 2. Ready to change cutters.

NEW TYPE OF METAL SLITTER, MANUFACTURED BY BLAKE & JOHNSON COMPANY, WATERBURY, CONN.

A NEW CRUCIBLE BASE BLOCK

The Jonathan Bartley Crucible Company, Trenton, N. J., are now furnishing crucible users with an improved style of base block for supporting crucibles. This base block, as shown in the cut, is provided with an opening which when the block is placed in the furnace sets opposite to the direction of the flame and causes part of the heat to enter under the crucible. This brings the heat directly against the bottom of the crucible and obviates the necessity of heating through solid blocks several inches in thickness.



THE BARTLEY CRUCIBLE BASE-BLOCK.

The blocks illustrated above are made for any size of crucible from No. 40 up to 525. The manufacturers state that numerous experiments prove that these blocks save from 15 to 20 minutes' time on each heat.

COMBS GYRATORY RIDDLE

The description of this machine, manufactured by the Great Western Manufacturing Company, Leavenworth, Kansas, given in the October issue of THE METAL INDUSTRY contained some unfortunate clerical errors. The machine weighs less than 100 pounds, and not 300 pounds as there stated. The electrical con-

nection for operating the riddle can be made by means of an ordinary lamp cord and by reason of its light weight the machine can be moved around the foundry and the sand screened on the floor or at the mold where it is desired.

METAL SPINNING LATHES

Some recent improvements in the manufacture of metal spinning lathes of P. Pyribil, New York, are shown in the accompanying cuts. One of these improvements consists in the substitution of cast iron for wood for the driving pulley of the headstock. It has been found that iron is a better material to make these pulleys of, as it does not offer any opportunity for the shrinking or warping that wood is subject to, and thesefore throwing the pulley out of line. Another feature of this machinery is shown in Fig. 1 and consists of what is known as the "extension bed." The swing is 22 inches when the gap is closed and 44 inches with the upper part of the bed extended, which is done by a screw with hand wheel at the end of the lower bed. The lathe can be equipped for spinning or turning oval work as desired.

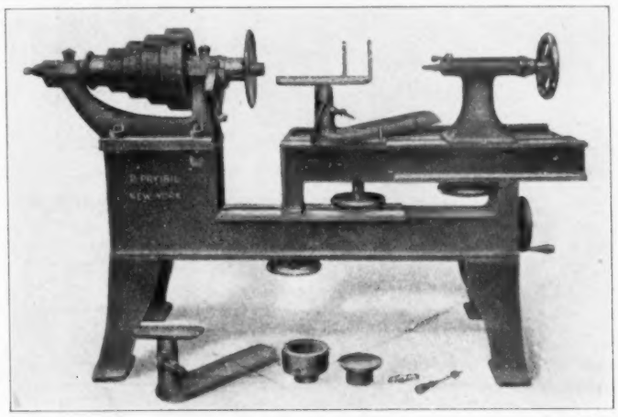


FIG. 1. SHOWING EXTENSION BED WITH 44-INCH SWING.

The machine shown in Fig. 2, is used for oval work and is a 22 inch metal spinning lathe with a six inch balanced Type E oval chuck. A notable feature on this machine is the safety

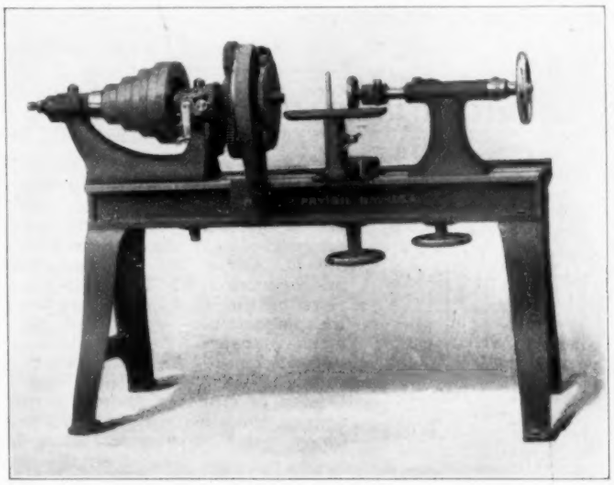


FIG. 2. 22-INCH PYRIBIL METAL SPINNING LATHE WITH 6-INCH BALANCED OVAL CHUCK TYPE "E."

guard, which covers the gears, thus protecting the workman from danger of entanglement. The above firm has a number of other types and forms which are fully illustrated and described in Catalog No. 11, which may be obtained upon application.

CRAWFORD CORE OVEN

The Crawford sectional core oven with enclosed flame gas burner was designed to furnish foundries with a means of baking cores quickly, economically, and with uniformity. In the past it has been difficult to bake evenly in all parts of the ovens obtainable. Cores might be baked hard in one corner of the oven, while in another, a baking temperature could not be reached; or one part of a core might be perfectly baked, while the other was still soft. In the Crawford sectional ovens, equipped with the enclosed flame gas burner, burning gas with air under pressure, even temperatures, it is claimed, are secured and maintained throughout the oven, assuring uniform core baking. A rapid circulation of heated air under pressure is maintained in the oven, and by this method the moisture is rapidly driven off through the vents.

The type known as the Crawford sectional draw-plate oven is especially designed for the convenient handling of cores. This oven is made both single and double. The single oven is operated from one end, while the double oven is made to be operated by two gangs of men, one working from either end. False backs to the drawers, which are equipped with roller bearings keep the heat in the oven when the drawers are pulled out. Substantial structural iron work extends from these ovens for securely holding the tracks on which the drawers run.

The insulation of the Crawford sectional oven is thorough and permanent. No loose material is used to prevent rapid installing or subsequent moving of the oven to another location. The setting up is easily and quickly accomplished. The enclosed flame gas burner is designed to get every available heat unit out of city, natural, gasolene or producer gas. Air from a positive pressure blower is forced into the burner, making perfect combustion, and after being highly heated passes into the oven,

CRAWFORD SECTIONAL TEN-DRAWER CORE OVEN.

causing a rapid circulation of air in the oven, which assures the even temperature referred to above.

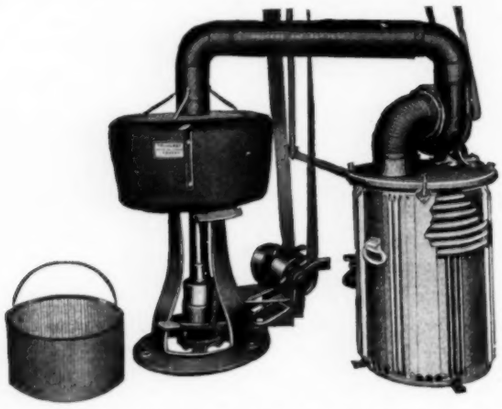
High economy in using gas as a fuel is possible only when a proper supply of air is furnished to support combustion, and in the Crawford sectional oven, equipped with enclosed flame gas burner, we find that not only is every available heat unit obtained from the gas, but the heat is held for use by the complete method of insulation. Core ovens are constructed in all sizes, and designed to meet the conditions existing in various foundries. The makers—the Oven Equipment and Manufacturing Company of New Haven, Conn., will gladly supply descriptive matter, or will, upon request, investigate the oven requirements of any foundry, and suggest the types and sizes of ovens necessary to most economically handle the work.

JEWELER'S DRYING-OUT MACHINE

The Tolhurst Machine Works, Troy, N. Y., have lately placed upon the market a new drying-out machine for jeweler's use. This machine is a natural evolution from the centrifugal dryer, manufactured by the same company, which was described in the June, 1911, issue of THE METAL INDUSTRY. The principles involved in the apparatus, which is shown in the cut, are exactly the same as those embodied in the centrifugal dryer, except that two baskets can be used in this machine at the same time. This machine is made with three sizes of removable baskets with diameters of 12, 16 and 20 inches, which sizes meet more gener-

ally the demands of those handling small material, principally manufacturing jewelers.

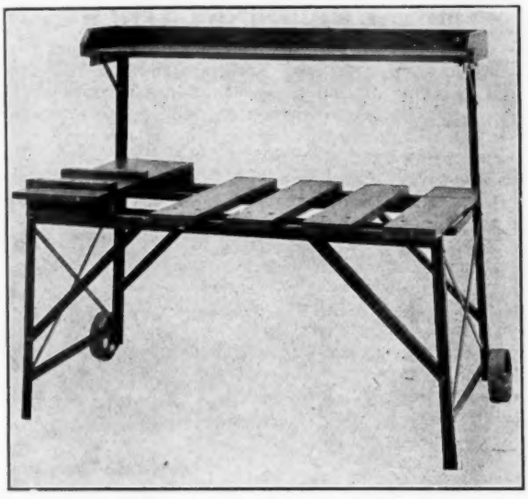
Among the applications of the drying out machine are: for small acid-dipped, plated parts, such as safety pins, collar buttons, rifle bullet jackets, blanks for tableware and coins, and other small articles of numerous kinds. It might be interesting to note that the United States Mint at Philadelphia has installed two more of these dryers and now has four in use.



THE TOLHURST REMOVABLE BASKET DRYING-OUT MACHINE.

AUTO MOLDERS BENCH

The auto molders' bench, illustrated here, is made by the Sand Mixing Machine Company, 220 Broadway, New York, who state that it is suitable for either stationary or portable work. It is made of steel, weighs only 95 pounds, yet is perfectly rigid and so constructed as to be practically indestructible. It is 4 feet, 2 inches in length, 27 inches high to top of molding table, and 18 inches from top of table to top of shelf. It is easily moved by one man, and for some kinds of work this portability is an exceedingly valuable feature, while in any shop it is useful, as it saves the time wasted in carrying molds, enables the molder to get away from windows that are hot in summer and cold in winter, and has other advantages. The circular sent out by the manufacturer states that the price at which the bench is sold is less than the cost of a good wooden bench.



THE AUTO MOLDER'S BENCH.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

President, H. R. Atwater, Cleveland, Ohio; Secretary, C. E. Hoyt; Treasurer, J. S. McCormick, Pittsburgh, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in connection with the meeting of the American Foundrymen's Association. The next exhibit and convention will be held at either Chicago or Milwaukee in 1913.

The annual meeting was held in Pittsburgh, October 28. To further promote the educational work of the American Foundrymen's Association and the American Institute of Metals, the company decided to donate to the former organization $500 and to the latter $250. Exhibitors at the recent Buffalo convention were given a rebate of 15 per cent. on the cost of the space they occupied. Officers were elected as follows: F. N. Perkins, Arcade Manufacturing Company, Freeport, Ill., president; C. E. Hoyt, Lewis Institute, Chicago, secretary; J. S. McCormick, J. S. McCormick Company, Pittsburgh, treasurer.

AMERICAN INSTITUTE OF METALS

President, L. W. Olson, Mansfield, Ohio; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 106 Morris avenue, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The next convention will be held at Chicago or Milwaukee in 1913.

Secretary Corse reports that the following committees have been appointed for the coming year:

Committee on Papers—H. W. Gillett, Ithaca, N. Y., chairman; F. O. Clements, Dayton, Ohio; J. P. Metzger, Paterson, N. J.; Wm. Langsenkamp, Jr., Indianapolis, Ind.; Philip Mueller, Decatur, Ill.

Committee on Publications—W. R. Webster, Bridgeport, Conn., chairman; W. L. Belknap, Bridgeport, Conn.; G. H. Clamer, Philadelphia, Pa.

The purpose of this latter committee is to supervise and edit the discussions which were presented at the meeting, after these discussions have been submitted to the authors for correction.

This is a new departure for the Institute and should lead to very satisfactory results.

The following is a list of the new members:

Robert Dent, The Brandt-Dent Company, Watertown, Wis.

Massey-Harris Company, Toronto, Ont.

Metallurgical and Chemical Engineering, 239 West 39th St., New York, N. Y.

W. S. Rockwell Company, 50 Church St., New York, N. Y.

Prof. Enrique Touceda, Rensselaer Polytechnic Institute of Troy, Albany, N. Y.

Geo. S. Youngs, Bridgeport, Conn.

Frank A. Clark, Rome Brass and Copper Company, 603 Floyd St., Rome, N. Y.

Dorsey Alfred Lyon, Box 83, Oakland Station, Pittsburgh, Pa.

There will be a meeting of the Joint Boards of the American Foundrymen's Association, the Associated Foundry Foremen, The American Institute of Metals and The Foundry and Machine Exhibition Company, at Chicago, on December 3, to select the time and place for the next convention.

NEW ENGLAND MANUFACTURING JEWELERS' AND SILVERSMITHS' ASSOCIATION.

President, Harry M. Mays, Providence, R. I.; Treasurer, Wm. T. Chase, Providence, R. I.; Secretary, Henry Wolcott, Providence, R. I. All correspondence should be addressed to the Secretary, Providence, R. I. The objects of the Association are for the commercial and educational welfare of manufacturing jewelers and silversmiths.

The annual meeting of this association was held at the Masonic Temple, Providence, R. I., on Saturday evening, October 27, about 150 members being present. The meeting was preceded by a dinner. The reports of the officers and committees showed the association to be in a flourishing condition, and several addresses, dealing with subjects of interest to the members, were made.

The following officers were elected for the ensuing year: Vice-presidents, Theodore W. Foster, Providence; T. S. Carpenter, Attleboro, and W. B. Ballou, North Attleboro; treasurer, William T. Chase, Providence; secretary, Henry Wolcott, Providence; directors, Everett L. Spencer, George H. Holmes, Harry Cutler, Frank T. Pearce, John M. Buffinton, Edgar R. Barker, Henry G. Thresher, Ralph S. Hamilton, S. D. Binge, Louis Lyons, Harry M. Mays, Edward B. Hough, A. K. Potter, F. C. Lawton and Jacob Solinger, of Providence; Ralph C. Thompson, E. E. Hale, Harold E. Sweet, Morris J. Baer and F. C. Wilmarth, of Attleboro; William H. Bell and George K. Webster, of North Attleboro; Frank P. Daughaday, of Chartley; C. A. Whiting, of Plainville.

According to the new by-laws the board of directors will meet later and organize by the election of a president and the appointment of working committees which will have charge of various fields of labor.

Judging from the statements made by several of the members, the changes made in the management will prove not only much more efficient but will have the effect of securing greater interest in the work that this association plans to do and has in future for its objects.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

President, E. P. Bullard, Jr., Bridgeport, Conn.; First Vice-President, A. T. Barnes, Rockford, Ill.; Treasurer, Albert E. Newton, Worcester, Mass.; Secretary, C. L. Taylor, Worcester, Mass. The objects of the Association are to promote the interests of machine tool builders in the direction of good fellowship and the liberal discussion of subjects relating to the improvement, standardization of parts and methods of manufacturing machine tools. The Association meets annually in the fall in New York City and semi-annually in the spring at places selected by vote of the members at the annual meeting. Correspondence should be addressed to the secretary, C. L. Taylor, Worcester, Mass.

The eleventh annual convention of this association was held at the Hotel Astor, New York City, October 16, 17 and 18. There was a large attendance and much interest was shown in the various questions discussed. After the report of the various committees, A. H. Emery, Jr., described the new planer dynamometer devised for the Bureau of Standards, with the advice of the advisory committee on cutting tools of this bureau. At the second session, W. A. Viall presented an address on export trade; Stanley H. Bullard advocated "The Use of an Association Catalog in the Development of Markets"; Samuel W. Banning read a paper on "How United States Patents Might be Made of Greater Value to Patentees."

The second day's sessions were devoted principally to F. A. Geier's address on "Tariff Legislation and Its Influence on the Machine Tool Industry," and a paper entitled "How Could the Association be Benefited by the Formation of a Mechanical Section." The question of the formation of a mechanical section of the association was referred to a special committee for further investigation and report at the spring meeting. After considerable discussion on the advisability of changing the name of the association, so as to signify the broader scope to which there has been a tendency, it was resolved to retain the present name. The various committees were well attended and a general feeling of satisfaction with business conditions seemed to prevail.

The following officers were elected for the ensuing year: E. P. Bullard, president; A. T. Barnes, first vice-president; R. K. Le Blond, second vice-president; A. E. Newton, treasurer; C. L. Taylor, secretary.

ELECTRO-PLATERS' ASSOCIATION

President, Richard H. Sliter, Jersey City, N. J.; Recording Secretary, A. J. Stremel, Brooklyn, N. Y. All correspondence should be addressed to the Secretary-Treasurer, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d street, New York, on the fourth Friday of each month, 8 p. m.

The regular monthly meeting of this association was held on Friday evening, October 25, and two applications for active and one for honorary membership were acted upon favorably. Samples of bright platinum plating were exhibited, together with some silver anodes that had worn down to a weight of five ounces from over one hundred ounces. Arrangements are under way for a convention and also for a banquet, to be held in the spring of 1913. Addresses were made by Dr. W. App Jones, Charles H. Proctor and S. Shoeld, who dwelt upon the advisability of using barium cyanide for the regeneration of silver baths which contain an excess of potassium carbonate. The meeting was well attended and the "recess" plan seems to have been a good move, as many views are exchanged and questions asked which do not always seem of sufficient importance to warrant formal discussion.

The October meeting of the Philadelphia branch was also held on the 25th, with fifteen members present. Several applications for membership were received, and a committee consisting of A. B. Wells, J. R. Moore, J. L. Dinan, Hugo Hermanns, Martin Smith and F. C. Clement was appointed to arrange for a banquet for the members and their wives, to be held November 27.

The Chicago branch is also planning for an open meeting and banquet, to take place in the early part of December. The committee in charge is working hard and report that they will have some prominent men present and expect this to be a big event.

ITEMS OF INTEREST TO THE INDIVIDUAL.

DEATHS

WILLIAM H. CORBIN

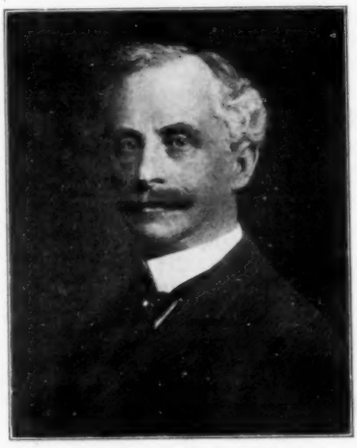
William H. Corbin, vice-president of The Joseph Dixon Crucible Company, died at his country home in Sullivan County, New York, on September 25, of heart disease. He was born in McDonough, N. Y., in 1851 and was educated at Cornell University and the Columbia Law School, from which he graduated in 1872, being admitted to the New York bar. Two years later he moved to Jersey City and was admitted to the New Jersey bar. He took up his residence, however, in Elizabeth, where he has ever since retained it. Mr. Corbin was a very able business man as well as a lawyer.

W. H. CORBIN.

Dr. Morris Loeb, president of the Chemists' Club of New York, and former professor of chemistry in New York University, died at Seabright, N. J., on October 8, from typhoid fever after a brief illness.

HENRY L. WADE

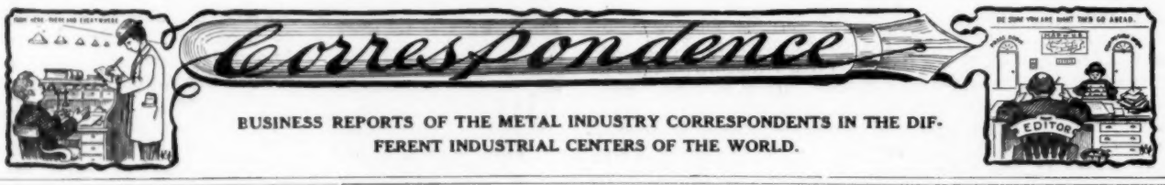
Henry Lawton Wade, president of the Waterbury Clock Company, died in his home in Waterbury, Conn., on October 30, after a long illness. Mr. Wade was born in Harrisville, R. I., on May 24, 1842, but spent his early life in Williamsville, Conn. He went to the Civil War from Pomfret in Company K of the 18th Connecticut Volunteers and proved a model soldier.



H. L. WADE.

After the war Mr. Wade located in Waterbury and was bookkeeper in the Waterbury National Bank. Later he became interested in the Waterbury Clock Company and other industries, and eventually became one of the leading financial men of the Brass City, and was also deeply interested in church and charitable work. He is kindly remembered in this section by the members of the 18th C. V. and he never lost interest in his old comrades.

Mr. Wade is survived by a widow, two daughters, two grandchildren and three sisters.



BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

PROVIDENCE, R. I.

NOVEMBER 4, 1912.

On every hand is the busy hum of industry, and never in many years has general business been so good. This is applicable to all kinds of business, but more especially in the metal lines. The quadrennial "bug-a-boo" of the presidential election has had no deleterious effect and prosperity has been the experience of everyone. This is especially the case with the manufacturing jewelers, who are, as a rule, driven to the capacity of their plants and working overtime. Not only have these concerns sufficient orders on hand to keep their factories in operation until after the holidays, but also into the new year. Horace F. Carpenter, who founded the firm of H. F. Carpenter & Son, gold and silver refiners, assayers and smelters, 58-60 Page street, has retired from the active management thereof and the business will be conducted by his son, Horace A. Carpenter, who has been associated with his father for 26 years. The business has been established 53 years. The W. H. Coe Manufacturing Company of this city has been granted an injunction in its suit against the American Roll Gold Leaf Company, also of this city, and Charles E. Smith, of Cranston, R. I., a former employe of the Coe Manufacturing Company, for infringements on the Coe Company's patent rights in the use of a machine for packing decorative films and a package roll of metallic leaf. The decision was given by Judge Arthur L. Brown of the United States District Court of the District of Rhode Island.

The Superior Court has granted the petition of William H. Thurber, of this city, one of the stockholders of the Loxit Company for the dissolution of the corporation, and George V. Nichols was appointed receiver to close up the business. Secretary of State Parker has issued a charter to the S. E. Buxton Company, of this city, the incorporators named being Frances A. Buxton and Henry H. Buxton, of Buttonwoods, and Henry H. Hayes, of Woonsocket. The concern will engage in the manufacture of jewelry and novelties, the capital stock being $5,000.

H. J. Astle & Company have been unusually busy this fall in furnishing their polishing systems and sand blasts. They have recently shipped nineteen cases of Boland machinery to Pawper & Weiss at Paris, France; installed a Boland two-cylinder positive pressure blower at the factory of W. H. Saart Company at Attleboro, Mass.; a fourteen lathe polishing system at the Attleboro Manufacturing Company's plant at Attleboro; a portable polishing system in several other shops. Frank P. Boland of the company has recently invented a new jar for solutions, one that is both acid and cyanide proof, and for which a patent is pending.—W. H. M.

ATTLEBORO, MASS.

NOVEMBER 4, 1912.

This is the month that the familiar slogan about buying early for Christmas gets in its work, and the jewelers have been busily preparing for the rush. The season has been an unusually good one, far beyond the average election year, and shops have been working nights to keep up with orders. The jewelers have put in some hard work to retain the protective tariff and are confident that only ill-advised changes can spoil the future which now looks so rosy. The $125,000 Bates block fire in January, followed by the $75,000 Watson block fire, will bring the total fire loss of the year above the usual Attleboro average. As an evidence of the jewelry rush, one concern in Attleboro doing engine-turning had eleven machines going last month and was able to take care of the business of only one jewelry firm.—C. W. D.

BRIDGEPORT, CONN.

NOVEMBER 4, 1912.

Business in the various factories of this city continues in good condition, and all are working full time, and the outlook for the winter appears to be very good. A number of additions to buildings and other improvements are being made, all classes of labor are well employed, and in some trades it is difficult to supply the demand. The employment bureau of the local manufacturers' association, which supplies a large number of its members with help, reports that very few workmen are calling at the bureau looking for employment, which would indicate that the number of unemployed is very small.

The L. C. Smith Company, which recently moved to this city from New York, has rented a factory building on John street. This concern is engaged in the manufacture of bronze. The first monthly dinner of the local manufacturers' association was held at the Stratfield Hotel, October 29. John R. Simpson of William Filene Sons Company addressed the members on the various methods and means his company has adopted for the welfare and benefit of its employees. The meeting was well attended and proved very interesting. R. B. Curtiss, for the past few years sales manager of the Royal Equipment Company of this city, has left to become sales manager of the Chase Motor Truck Company with headquarters at Syracuse, N. Y.—F. A. B.

BUFFALO, N. Y.

NOVEMBER 4, 1912.

Optimism of a decided nature rules the manufacturing jewelry trade in Western New York, and locally this condition is very apparent. In a measure the nearness of the holidays is responsible, and all of the big manufacturers declare that prospects are of the most cheerful sort. Coming as this condition does after a summer of laxity and quiet, the present condition is a highly satisfactory one.

The White, Wile & Warner Company, manufacturers of "W. W. W." jewelry, is now well settled in its new quarters on the top floor of the palatial new Burrell Building, corner of Goodrich and Main streets, with improved facilities, splendid show rooms and every up-to-date detail in the jewelry manufacturing line that makes toward the perfect equipment of the firm's output. Most of the brass foundries report a rush of business, with their forces working overtime to make good on orders, while their books are crowded with futures.

About fifty firms are affected by a strike of metal workers, which is now in its second month. The employees are demanding an increase in scale, with the closed shop. Both sides are sanguine of success, and thus far all efforts at arbitration have proven fruitless. Meantime shops are running short-handed and doing the best thing possible, while the want ad. columns are receiving their quota of calls for help.

More than 3,000 retail hardware dealers are expected to attend the eighth annual convention and exposition of the New York State Hardware Association, to be held in this city February 18-21, 1913. Reservations have already been made for space in the Broadway Auditorium by more than 300 exhibitors. —H. S.

CLEVELAND, OHIO

NOVEMBER 4, 1912.

Manufacturers of metal goods in this territory report a bumper fall business. Factories are running to capacity and a number of them are working night shifts. Never before in the history of the metal industry in this city have conditions been in better shape. Automobile factories are all busy preparing to turn out cars for next year, while the manufacturers of plumbing and similar goods say they have never enjoyed a better season than that of the present year. Plating establishments all over the town are behind in their orders and some are even refusing business because they are not able to take care of it.

The National Copper Refining Company of Cleveland, has been incorporated with a capital of $250,000. Incorporators of this new concern are: E. H. Rand, F. H. Rand, Julius Bloomburg, Eugene E. Wolf and Nathan Komito.

Employees of five Cleveland manufactories of chandeliers have been enjoying a strike recently. The men demand nine hours a day with Saturday half holiday. Several of the manufactories have acceeded to their demands but others have denied them. Police prosecutors here are investigating the methods of business being used by a silverware company doing business in a big down town building. A number of complaints have been made in regard to the matter. According to the police prosecutor, the company has been advertising Rogers silverware at $9.50 per set. Tickets are sold, the holders of which are to pay the concern twenty-five cents each week until the full amount has been paid. The purchasers it is said, were offered an inferior grade of goods which could be purchased anywhere for $1. The authorities here believe they have stamped out the practice.—S. L. McM.

COLUMBUS, OHIO

NOVEMBER 4, 1912.

The metal market in Columbus and vicinity has been ruling brisk during the past month. With the general improvement in business conditions, especially in iron and steel circles, there is renewed demand for many kinds of metals. Many of the Columbus users of metals are engaged in making parts and accessories for automobiles, which business is booming in every particular. This is true especially of concerns making windshields and auto lamps.

Foundries are also busier in this section now, and as a result there is a better demand for pig iron. In fact every branch of the trade is active and brass, copper and aluminum are all strong. The most noticeable advance has been in aluminum, which enters largely in automobile construction. Scrap brass is quoted at 12¾ cents, while scrap copper is sold at 15 to 15½ cents. Aluminum clippings are sold at 22 cents, while cast aluminum scrap is quoted at 20 cents. Hardware manufacturing concerns are doing a nice business and the same is true of plumbers' supply manufacturers. Collections are reported as better in metal circles. Work has been started on the large addition to the plant of the John Brown Manufacturing Company, located at 1571 Hawthorne Park, Columbus, Ohio. The John W. Brown Manufacturing Company manufactures automobile lamps exclusively and has secured a contract to supply the Ford Company with automobile lamps for the 1913 season.—J. W. L.

DETROIT, MICH.

DETROIT, November 4, 1912.

Detroit brass and aluminum manufacturers are rejoicing over the fact that traffic difficulties are practically eliminated and that no such handicap will be experienced this winter as was passed through last. The Michigan Central, the Grand Trunk and several other lines entering the city from every direction have been busy the last summer and laid hundreds of miles of terminal tracks which will, it is believed, relieve all further danger of traffic congestion.

Plants that were contemplating departing from the city have reconsidered their determination and from now on Detroit has every indication of a most successful period of manufacturing prosperity. Every brass and aluminum establishment in the city is operating steadily the same as they have for the last several

months. The presidential campaign has in no way affected business here and whichever way the pendulum may swing will have no effect on the business outlook. Manufacturers are preparing for heavy business throughout the winter.

One of the latest concerns to engage in business in this vicinity is that of the H. Mueller Manufacturing Company, of Decatur, Ill., which has started a branch at Sarnia, Ontario, across the river from Port Huron. A factory building has been remodeled to suit the needs of the concern and will be in operation before another month passes. Members of the office staff are now arriving at the plant. F. Riggins, of Decatur, Ill., will have charge of the office and C. W. Padgett, of New York, the shipping department. They will make their home in Sarnia from now on. The brass and aluminum establishments in connection with the automobile industry are all busy as usual and will continue so indefinitely. Manufacturers are now engaged on the 1913 model cars and are rushing their plants to meet demands from all parts of the country.—F. J. H.

LOUISVILLE, KY.

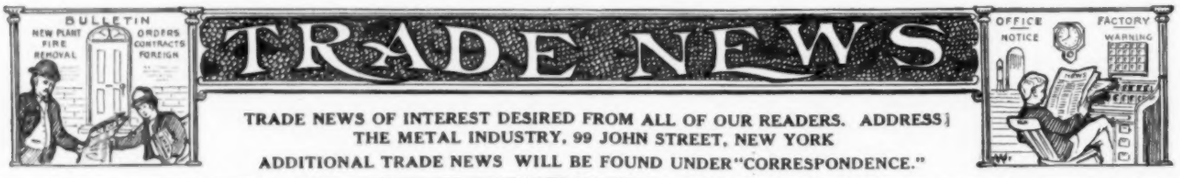
NOVEMBER 4, 1912.

Practically all lines of the metal trades here report a fairly good business, with prospects flattering for better. The firms specializing in distillery equipment are particularly busy just now, as the season for the whisky manufacturers is opening up, and they are overhauling their plants, repairing old equipment and purchasing new where necessary. The manufacturing jewelers are another group who are especially busy, answering the usual demands made upon them in anticipation of the Christmas trade, which is expected to be better this year than for some time past, on account of the generally prosperous tone of business at large.

The Standard Sanitary Manufacturing Company reports a daily consumption at its local plant for the manufacture of plumbing supplies of about three and one-half tons of scrap copper a day. This material is found to be quite as satisfactory for the purposes of the company, when it can be obtained, as ingot copper, besides having the advantage of being nearly two cents a pound cheaper. Matt Corcoran & Company, manufacturers of distillery supplies, report an extremely good business in their special lines; so much so that they are finding it difficult to get sufficient skilled labor for the work on hand. The Vendome Copper & Brass Works, which is in the distillers' equipment trade, is also crowded with work, and has found it necessary recently to keep going until 9 o'clock at night in order to prevent falling behind with orders. This concern recently equipped a large plant at New Orleans.

The George Katman Company, manufacturing jewelers, recently moved to the new Armstrong Building at Third and Walnut streets, having outgrown its old quarters on Fourth avenue next door to the old Avenue Theater. At the new building it has three thousand feet of floor space, with plenty of daylight, as every room is an outside room, and there is a large skylight. All of the machinery is run by individual motors, a feature of many manufacturing plants of every description in Louisville. The new plant of the company is divided into three large rooms, one each for the office, store-room and work-shop. Several additions have been made to the working force, and the business is expanding generally, indicating that the move into larger and better equipped quarters was made none too soon. The new plant of the Knoxville Smelting & Refining Company, the equipment of which was recently completed at Knoxville, Tenn., is ready to begin operations on an extensive scale. The plant is modern in every respect, and expects to be able to handle a large quantity of ores, especially lead and zinc., to the best advantage. The system of furnaces installed in the plant is patented by Allen R. Partridge, who has built a number of smelting plants under his own designs in the West. The plant will be in charge of C. H. Mace, formerly of Arizona.

The Aluminum Company of America, with headquarters at Pittsburgh, announces that no definite plans have as yet been completed for its proposed hydro-electric plant and aluminum works near Knoxville, Tenn. At a future date these plans will be definitely formulated and announced to the trade. The Wadsworth Watch-Case Company, of Dayton, Ky., has had plans prepared for an additional building at its plant, which will be used for its plating department. The expansion of the company's business has rendered this additional room necessary to relieve crowded conditions in the old building.—G. D. C.



TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

R. C. Jenkinson & Company, metal goods manufacturers, Newark, N. J., will soon begin to make extensive alterations and improvements to their factory building at 289 Washington street.

The Germann Bronze Company, Erie, Pa., are erecting an addition to their plant 44 by 60 feet, which will effect an increase of about 40 per cent. in their capacity. Some new machinery will be installed.

The International Silver Company, Meriden, Conn., have moved into the recently completed addition to their factory on Butler street. This new building is 40 by 160 feet, and is built of concrete and steel.

The United Metals Selling Company, 42 Broadway, New York, as announced on another page, are now sales agents for the pig lead produced by the International Lead Refining Company, East Chicago, Ind.

R. E. Eckert and George Turdell of London, Ontario, have purchased a plant at Chelsea Green, Ontario, and it is stated that they will remodel it and install new machinery for manufacturing hardware specialties.

The Star Plating Works, 98 Broadway, Buffalo, N. Y., have recently installed new tanks to take care of increasing business. This firm does work on bicycles, auto parts and stoves, and report that they have been very busy.

The Tallman Brass and Metal Company, Hamilton, Ontario, state that they are very busy in their factory and have rushed up a temporary addition to take care of present orders. In the spring they expect to put up a permanent building.

The Globe Machine & Stamping Company, manufacturers of tumbling barrels, dies, stampings and sherardizers, Cleveland, Ohio, state that they have commenced an addition to their new plant which will be used as a sherardizing department.

The Stanley Bronze Company, which was recently incorporated at Bridgeport, Conn., will make castings from all metals and alloys. The officers are: Henry D. Stanley, president; Brayton P. Stanley, secretary; Willard D. Stanley, treasurer.

The Hotz Foundry & Machinery Company, manufacturers of brass and aluminum castings, principally for automobiles, Fremont, Ohio, find that their present quarters are too small and will erect a new plant as soon as they have secured a new site.

It is reported that the new buildings of The Electrical Utilities Company at New Hamburg, Ontario, are about completed and that complete equipment will be required for the brass and iron foundries, machine shop, electro-plating and woodworking departments.

The William A. Hardy & Sons Company, brass founders, Fitchburg, Mass., are about ready to start the erection of an addition to their foundry. The new building, which will be 125 by 35 feet, will be occupied by the melting department and as a stock room.

The Eynon-Evans Manufacturing Company, brass founders, Philadelphia, Pa., whose new plant was illustrated and described in the June issue of THE METAL INDUSTRY, have installed additional core room equipment and are considering the installation of a sand blast equipment.

Among the Waterbury, Conn., concerns that are reported to be enlarging are the American Brass Company, who will build a three-story office building, 231 by 68 feet, at a cost of approximately $200,000; and The Pilling Brass Company, who are building a new steel and concrete factory.

Frank Little, who has been conducting a foundry for several years at Athens, Pa., has leased a part of the old plant of the American Bridge Company, which he will fit up as a foundry to do all kinds of work in iron, brass and aluminum. The plant will be open for business on January 1, and will employ about ten men.

The Abbott Ball Company, manufacturers of ball-burnishing products, Hartford, Conn., report through G. E. Abbott that they are now located in their new factory, which has more than double the capacity of their old plant. However, their business is growing at such a rate that they are compelled to run eleven hours a day in order to keep up with orders.

The Baird Machine Company, manufacturers of automatic machinery, presses and tumbling barrels, Bridgeport, Conn., report through Albert Pott that their plant has been working overtime for twenty-three hours a day for some months, and they are contemplating the erection of an addition, but have no definite particulars to give out at the present time.

The Bennett-Mervin Silver Company, New Milford, Conn., whose incorporation was noted in the October number of THE METAL INDUSTRY, will be ready about December 1, to take orders for all kinds of britannia ware, silver plate and sterling. The officers of the company are: Charles A. Bennett, president; Verton P. Staub, vice-president; Marcus G. Merwin, secretary; Merritt B. Merwin, treasurer and manager.

The Brown Instrument Company, Philadelphia, Pa., and its associate company, the Keystone Electrical Company, manufacturers of pyrometers, thermometers and other electrical instruments, report that their business has been growing so rapidly that they have been compelled to arrange for three times the amount of space they now occupy. They expect to move into their new quarters some time after the first of the year.

The Precision Die-Casting Company, Syracuse, N. Y., has moved into its new offices and factory. The new home was formerly the factory of the E. C. Stearns Manufacturing Company, makers of the once famous Stearns bicycles. The Stearns company continues to occupy a part of the building in the manufacture of sand-castings, hardware specialties and typewriters. The Precision company reports greatly increased business and anticipates a record year.

Ellwood Ivins' Tube Works, Mills Oak Lane Station, Philadelphia, have broken ground for an addition to their office building, which will give them just about double the floor space of their old office. They report an abundance of orders and enough orders ahead to last many months to come. They are also enlarging facilities in their mills by added furnaces and more machinery. Their product in seamless steel tubing is well known throughout the trade for extreme accuracy and high class.

The Fort Wayne Electric Works of General Electric Company, Fort Wayne, Indiana, report through E. A. Barnes, superintendent, that they have been completely rearranging their plant and have installed six oil burning furnaces and also over a quarter of a million dollars' worth of machine tools in a factory of 120,000 square feet of floor space. Among these tools is every known variety of drill, milling machine, shaper, lathe and a number of special machines not usually marketed.

Baumann & Monnier, of New York City, announced under date of November 1 that they have formed a co-partnership under the above name to do a general and brokerage business in chemicals, dye stuffs, drugs, gums, oils, etc. During their many years' connection with the well known firm of A. Klipstein & Company they gained wide and varied experience both in regard to the trade and its requirements. Their connections with the leading importers and manufacturers are of the best and will enable them at all times to quote lowest possible prices.

The Standard Brass and Metal Works, Inc., manufacturers of phosphor, manganese, and government bronze; gun metal; white metal; composition yellow brass, and aluminum castings, Knoxville, Tenn., has one of the most complete and up-to-date plants in the South. The output of this plant is sold through the W. J. Savage Company, and shipments are made to all parts of the country. This company was established in 1911, and the officers are W. J. Savage, president; B. S. Newman, vice-president and general manager; C. M. Funck, secretary and treasurer.

The Allen-Murphy Company, Chicago, Ill., report through L. D. Allen that they have just moved into their new offices, factory and warehouse at 123-125 W. 46th place. They have about 10,000 square feet of ground here, with every facility for taking care of large metal business. The products of this company include triple alloyed babbitts for all purposes, type metals, etc. They are also connected with a company that manufactures lubricating greases of various kinds. Thus, by selling both babbitt metal and lubricating greases, they are able to quote rock-bottom figures.

The Duplex Metals Company, manufacturers of copper-clad steel products, Chester, Pa., have awarded contracts for an addition to their coating department, 100 feet square. Two 25,000-pound and four 10,000-pound rotary copper melting furnaces will be installed, and two 10,000-pound rotary furnaces will be installed in the present coating department. Motor-driven engines will replace steam in operating the 10 and 12-inch rolling mills. Two continuous heating furnaces, having a capacity of 100,000 pounds per ten-hour day, will also be built. These additions will more than double the capacity of the plant, and the coating departments will be operated as separate units.

R. F. Lang, of 31-33 Broadway, New York, who represents the "Royal" brand of alloys, and who was the pioneer in introducing commercially phosphor copper, manganese copper, arsen and silicon copper, has recently returned from his annual trip abroad. Mr. Lang has completed arrangements with one of the largest and best equipped electro-chemical works in Germany for the introduction of their specially prepared nickelsalts "Royal Brand," which are claimed to surpass in efficiency and quick action anything of a like character ever put on the market. Their great merit is acknowledged in the trade abroad, where it is said that they have revolutionized the plating industry.

The J. D. Smith Foundry and Machine Company, Cleveland, Ohio, reports the receipt recently of the following orders: Complete foundry equipment for the United Foundry and Machine Company, Bridgeport, Conn.; core ovens for the Allyne-Ryan Foundry Company, Cleveland; 8 core ovens and complete sand-blast cleaning system for the Interstate Foundry Company, Cleveland; a trolley system and core ovens for the American Car and Ship Hardware Company, New Castle, Pa.; core ovens for the Venango Mfg. Company, Franklin, Pa.; brass furnaces for the H. P. Muller Foundry, St. Louis. This company has also just received from Sweden an order for core-oven equipment.

The Chadwick Brass Company, Ltd., Hamilton, Ontario, which was recently incorporated with a capital stock of $800,000, are preparing to erect a thoroughly modern foundry plant. At present they have a large brass foundry for the making of brass, bronze and aluminum castings. They also do all kinds of drawn, stamped and press work, spinning and sheet metal work of

every description, as well as automatic screw and skid work and all kinds of metal specialties for the trade. It is the intention of the company to make aluminum cooking utensils and nickel-plated tea and coffee kettles and similar goods, and to increase their trade in the chandelier and metal goods lines. The directors are: Anthony L. Malone, Fred L. Whitney and Albert Mearns.

John C. Wiarda & Company, manufacturers of chemicals and electro-platers' supplies, Green, Provost, Freeman, Huron and India streets, Brooklyn, N. Y., report that the new plant they are now erecting will consist of nine brick buildings: An office, two-stories, 31 by 40 feet, a foundry, one story, 50 by 100 feet; a grinding department, three stories, 50 by 83 feet; three two-story storage houses, 50 by 100, 112 by 200 and 25 by 50 feet; acid manufacturing department, one story, 50 by 100 feet; boiler and engine room, one story, 50 by 75 feet; stable, two stories, 35 by 50 feet.

An industrial university will be established at Lomax, Ill., which has for its object the upbuilding of all industrial establishments to be located there. The institution will be controlled by a board composed of highly trained experts in mechanical engineering, electricity, chemistry, advertising and business management, and under the direction of this board there will be organized the following departments: A trade school for the special training in all industrial lines of all who may desire such training, free of charge; a technical school for higher training in mechanics, chemistry, electricity and factory management; an inventors' department for the benefit of all inventors of the United States with undeveloped or partially developed ideas, which may be worthy of the assistance of the institution.

C. F. Roper & Company, manufacturers of marine specialties, Hopedale, Mass., report that they have recently ordered the following equipment for their brass foundry from the Nicholson Sand and Supply Company, of Providence, R. I.: 10 barrels No. 00 Albany sand, 1 brass molder shovel, 2 brass molder riddles, 1 pair of bench rammers, 1 40-pound box of parting, 6 Thompson adjustable flaska clampa 14 inches, 6 Thompson adjustable flaska clampa 18 inches, 1 14-quartz galvanized iron sprinkling can, 1 soft brush, 1 gallon core oil, 1 pair No. 30 crucible tongs, 1 No. 30 single porin shank, 1 pair of pick-up tongs 40 inches, 6 No. 30 Taunton crucibles, 12 standard iron flasks 10 inches wide 12 inches long, 12 standard iron flasks 10 inches by 12 inches by 5 inches, 4 iron beveled flasks 23 inches on inside by 10½ by 4 inches deep.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., November 26, and publicly opened immediately thereafter to furnish at the Navy Yard, Brooklyn, N. Y., a quantity of naval supplies, as follows: Sch. 4929, brass hand lanterns; brass wardrobe locks; semi-finished brass nuts. Sch. 4941, hexagon bronze bars. At the Navy Yard, Washington, D. C., Sch. 4935, naval brass rod; naval bronze rod; sheet brass; hard-drawn, round copper rod. Sch. 4939, drawn brass bars. At the Navy Yard, Mare Island, Cal., Sch. 4928, sheet lead. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office nearest each yard, or to the bureau.

T. J. Cowie, Paymaster-General, U. S. N.

An innovation in the refinishing trade has been established by the Reliable Refinishing Company, 511 West 42d street, New York City. This is the giving of an absolute guarantee for a period of five years, on all lacquer work done by this company. The company state that they are the only refinishing concern using Damard lacquer and they are able to make this unusual guarantee because they use this lacquer exclusively. Damard lacquer originated in England, and has been in commercial use for many years among the most reliable metal goods manufacturers there. It is claimed that Damard lacquer has a glass-like hardness and brilliancy, is absolutely immune to atmospheric conditions and not affected by perspiration, alcohol, ammonia, acids or any other chemicals. The Reliable Refinishing Company say they have found that this lacquer will stand the most severe tests that can be made by applying ammonia, alcohol, acids, or in any other way, and that the lacquer is not affected by such tests; also that unavoidable marks, like fly-specks, can be wiped off without injury to it. They are well prepared to refinish any kind of metal articles.

ALUMINUM SCARCITY

In wide contrast to conditions a year ago when the supply of aluminum exceeded the demand it is reported that there is at the present time a scarcity of the metal, particularly in sheet, rod and wire form. Inquiry of the Aluminum Company of America, the only producer in America, develops the fact that this company is not quoting on ingot metal and can only take care of old customers on manufactured metal. The largest importers say that they have about all the business they care to handle for immediate delivery, but can quote, at a price, for future shipments. It is predicted that the present state of affairs will continue for a few months only, when the Aluminum Company of America hopes to catch up with the demand. There will soon be other producers in this country and this will produce enough aluminum for all. The Southern Aluminum Company, of Whitney, N. C., mention of which is made on this page, will soon be turning out the metal.. It is reported that the American Metal Company will soon begin on the erection of a large plant in the West. These, together with the probable reduction and possible lifting altogether of the tariff, make a bright outlook for aluminum for the many purposes for which it is so admirably fitted.

NEW ALUMINUM WORKS

The electrical equipment which will be installed in the new plant of the Southern Aluminum Company at Whitney, N. C., will represent units of the largest rating ever built for generating direct current. This installation will consist of seven vertical waterwheel type electric generators, furnished by the General Electric Company, Schenectady, N. Y. Each machine will have a rating of 5,000 kilowatts, delivering 20,000 amperes at 250 volts and operating at a speed of 170 revolutions per minute. Two smaller direct-current generators of the same type, rated at 2,500 kilowatts at 300 revolutions per minute; two 1,250-kva. alternators, having a speed of 514 revolutions per minute, with two 16-kilowatt exciters, and all necessary switchboard and controlling devices are also included in the installation, which will be one of the largest and most modern of its kind in the world. It is the intention of the Southern Aluminum Company to push to completion the project now under way and to have in operation in the course of the next eight months a manufacturing plant that will turn out some 25,000 tons of aluminum annually.

The enterprise has been financed in France and is closely associated with l'Aluminum Français, of Paris. The work at Whitney is in charge of Dr. Paul Heroult. Although he has been directing constructive operations there only a few weeks, remarkable progress has been made, and it is confidently expected that the entire plant will be in readiness for turning out the product of the company by the middle of 1914. In the complement of buildings are nine furnace rooms, wherein the alumina will undergo the various processes incidental to conversion into aluminum. Each of these structures measures 60 feet by 500 feet, and one electrode factory of similar dimensions is also included in the group.

ELECTIONS

At the regular monthly meeting of the Board of Directors of the Joseph Dixon Crucible Company, Jersey City, N. J., held Monday, October 21, the following changes in the officers and board of directors were made on account of the death of Vice-President William H. Corbin. George E. Long, former treasurer, was elected vice-president to succeed Mr. Corbin; J. H. Schermerhorn, former assistant secretary and assistant treasurer, was elected to membership in the board of directors and teasurer of the company; Albert Norris was elected to the office of assistant secretary and assistant treasurer.

FIRES

The plant of the Ohio Foundry Company, 9608 Quincy avenue, Cleveland, was damaged to the extent of $5,000 by fire on the night of October 30.

The National Brass and Copper Company, whose plant suffered a $2,000 loss by fire on October 28, has resumed in all departments and is now running regular turns.

CHANGE IN FIRM

The name of The Tea Tray Company, of Newark, N. J., was changed to The National Metal Stamping and Manufacturing Company on November 1. The Tea Tray Company, which was founded in 1867 by Walter C. Conger, developed in this country the process of coating serving trays with japan. Later on other lines of manufacture were taken up, such as gas and electric fixtures of copper and tin, phonograph horns and fire extinguishers. The object of the change of name is to become better identified with the nature of the business as it is now conducted. Additional capital has been introduced, which will result in increased facilities and the manufacture of new lines, such as copper tanks, slot machines, copper tea sets and other specialties.

The present officers of the company are G. A. Kruttschnitt, president, formerly president and general manager of the Aluminum Goods Manufacturing Company; James C. Coleman, vice-president and treasurer, formerly treasurer and secretary of the Aluminum Goods Manufacturing Company; Howard G. Hull, secretary, formerly secretary of The Tea Tray Company.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

The Dayton Brass Castings Company, Dayton, Ohio. Capital stock, $15,000. Incorporators: James D. Platt, Jr., and others of Dayton.

Greenville Brass Foundry Company, Jersey City, N. J. Capital $2,000. To deal in brass, bronze and aluminum castings. Incorporators: Wm. J. Maley, J. J. Ruley, C. W. Montanys, R. J. O'Reilly and P. Reilly, all of Jersey City.

Braddock & Burns Foundry and Machine Company, Wheeling, W. Va. Capital stock, $50,000. To manufacture copper, brass, bronze, aluminum and steel. Incorporators: William J. Braddock, C. A. Burns, J. B. Burns and others, all of Wheeling.

PRINTED MATTER

Trisalyt.—The Roessler & Hasslacher Chemical Company, New York, have issued a booklet giving flattering testimonials from fifty representative firms as to their experience in the use of Trisalyt, the salt for electro-plating in gold, silver, copper, brass, bronze and zinc.

Sand Blasts.—H. J. Astle & Company, Providence, R. I., have issued a 14 page bulletin in the interests of the Boland patented self-feeding sand blasts, for use by jewelers, silversmiths, electro-platers, chandelier and die makers, hardware and electrical manufacturers. Write for bulletin S.

Gear Bronzes.—The William Cramp & Sons Ship and Engine Building Company, Philadelphia, have issued a small booklet giving complete description of Cramp gear bronzes. Complete specifications are given for the various kinds of bronzes used in making gears. The booklet gives some very valuable information to those who are interested in the manufacture of gears of all kinds, and which have to be made of high-class metal.

Buffing and Polishing Wheels.—In a 36-page catalog issued by the Munning-Loeb Company, of Matawan, New Jersey, the subject of buffing and polishing wheels is gone into quite thoroughly. Besides illustrating over 20 different styles of buffs manufactured by this company, much practical information of interest to buffers is included. The matter on selection of raw materials and manufacture, the hints to buffers on testing muslin, setting up wheels, balancing wheels and the novel charts by means of which one can quickly determine the correct speed of buffs of different diameters to give a definite peripheral cutting speed, and the chart showing percentage of buffs wasted when discarded at different diameters, should be of interest to buffers or plant superintendents who have any buffing operations done under their charge. Interested parties are invited to write for a copy of this booklet.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

ADNEWS

Lacquers.—The New Era Lustre Company, New Haven, Conn., are advertising their metal lacquers in this issue.

Mechanical Plating Machines.—Rockhill & Vietor, 114 John street, New York, are emphasizing in this issue the good features of their Nonsuch Plating Machine. They report a large number of orders on hand, several being repeat orders from former customers.

Metal Spinning and Stamping.—The Toledo Metal Spinning Company, 2218 Detroit avenue, Toledo, O., are advertising in this issue their facilities for doing metal spinning and stamping of all kinds. They are also manufacturers of art brass goods, cuspidors, metal hot water bottles, etc. They make a specialty of carbureters, floats, etc., and also do die making and screw machine work.

Automatic Buffing Machines.—The Automatic Buffing Machine Company, 57 Indiana street, Buffalo, N. Y., print in their ad. this month the names of a large number of prominent metal manufacturers who use their automatic buffing machines. A cut is shown of an installation at the Badger Brass Manufacturing Company's plant at Kenosha, Wis., where twenty-four of these lathes are in operation. With this machine a great many different kinds of metal articles such as lamp parts, plumbers' goods, tea pot bodies, bedstead trimmings, cooking utensils, faucets, etc., can be buffed automatically in much less time than the same work can be done by hand.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY, 99 John street, New York. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds.

METAL MARKET REVIEW

NEW YORK, November 11, 1912.

COPPER.

The increase of over 16,000,000 pounds in the stocks of copper during the month of September came as rather a surprise to the trade. The figures for the month of November, published today, show another considerable increase. The foreign statistics, the stocks in England and France, show a decrease for the month of October of about 2,000,000 pounds. These figures need not be taken seriously in view of the fact that the consumption in England for the nine months of 1912 was considerably less than for the same period in 1911.

The most interesting feature to note, in the copper market for the month of October, is the support given to the market by the producing interests. When London broke from £79 at the opening to £72 5s., the low price of the month, it was the buying orders that were sent over from New York that saved the London market. On the New York Metal Exchange we have seen the same business carried on, 17¼ was bid for Standard Copper when the price in London was nearly 1 cent per pound lower. With about ½ cent per pound profit London houses, not in the copper combine, began selling here at this price and the buying orders were gradually reduced each day, as copper was coming out too freely, and today the best bid on the Metal Exchange is now 17 cents. These Wall Street methods of manipulation hardly seem legitimate in the copper market; the idea seems to be to create a demand for copper when there is no demand, or in plainer words to create a false impression regarding the copper market that is both harmful to the producer and misleading to the consumer.

Producers claim to be well sold up and are trying by fair means or foul to hold the price at 17¾ cents. Consumers, meanwhile, are all very busy, but will try and hold off as long as possible rather than pay the exhorbitant price asked by the producers.

Buying during the month has not been very active and prices today are about ¼ cent below the combination price. Lake is obtainable at around 17.50 to .55. Electrolytic 17¼ to ⅜ and Casting at 17¼ cents.

TIN.

The tin market has been held very firm at an average of close to 50 cents for the month. Opening at 50¼ cents, advancing close to 51 cents, dropping to 49.30 and closing at 50¼. The consumption for October is estimated at 3,850 tons, the total consumption for the ten months shows an increase of 3,650 tons compared with the same time last year.

Spot tin today is around 50¼ cents with November and December quotable at close to 50 cents.

LEAD.

The lead trust dropped the price of lead, $7 per ton on November 4, from 5.10, New York basis, to 4.75. Of course this sudden drop has completely demoralized the trade for the time being and the market is very much unsettled. Price in New York carload, 4.75 and East St. Louis, 4.60.

This lead matter will be taken care of by President-elect Wilson next year and the trust will no longer be able to manipulate the lead market to the detriment of every consumer in the country.

SPELTER.

The spelter market is a shade easier at 7¼ New York against 7.60 a month ago. The market has become practically an open market and there is less manipulation in this metal than for several months. New York price, 7½ cents and 7.30 to 7.35 East St. Louis.

ALUMINUM.

The market is very strong due to shortage of metal. The leading interest here is only able to take care of its own customers and will not quote outsiders on ingot. The importers of foreign aluminum are not in much better shape and will only sell in wholesale lots and apparently to special customers. The market is therefore very strong and higher prices are more than probable. The matter of 7 cents per pound tax on this article will most assuredly be taken care of next year as determined by the people of this great and glorious free country. The market today is around 27¾ cents to 28 cents while futures can be secured at about 26½ to 27 cents.

ANTIMONY.

This market has been quite active and prices have been advanced for all grades about ½ cent per pound. Cooksons is up to 10½ cents, Halletts 9¾, and other grades 9⅜ to 9½ cents.

SILVER.

The silver market has been active and higher, opening at 63⅞ cents. New York price advanced to 64⅛ and closes at 64½, with London 28¾d.

QUICKSILVER.

Market holds very steady at about $1.00 per flask below price ruling a month ago. Wholesale $41.00 per flask. Jobbing lots $41.50, $42.00.

SHEET METAL.

The sheet and tubes mills are driven to the limit and at that are behind in their deliveries. The trouble seems to be insufficient capacity for the present enormous consumption, the consumption has increased far beyond the present limit of production and the trade has to get along the best way it can with about half its needed supplies coming along. Sheet copper is quoted at 23 cents base, copper wire at 19 cents base. High sheet brass is unchanged at 17⅜ wholesale and 18⅝ smaller lots.

OLD METALS.

The market has been more or less dull and unsettled with the lower copper market and prices are shade lower than a month ago. Lead scrap is weak with the cut in raw material and the other metals are about the same as a month ago.—J. J. A.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

November 8, 1912.

Stocks of marketable copper of all kinds on hand at all points in the United States, October 1, 1912		63,065,587
Production of marketable copper in the United States from all domestic and foreign sources during October, 1912		145,405,453
		208,471,040
Deliveries:		
For domestic consumption	84,104,734	
For export	47,621,342	
		131,726,076
Stocks of marketable copper of all kinds on hand at all points in the United States, November 1, 1912		76,744,964
Stocks increased during the month of October		13,679,377

OCTOBER MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	17.75	17.50	17.70
Electrolytic	17.75	17.30	17.60
Casting	17.60	17.25	17.50
TIN	51.00	49.40	50.00
LEAD	5.10	5.00	5.05
SPELTER	7.65	7.50	7.55
ANTIMONY (Hallett's)	9.75	9.25	9.50
SILVER	64⅛	62⅞	63.45

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1911—Average for year 12¾. 1912—January, 14½; February, 14½; March, 15; April, 16; May, 16¾; June, 17½; July, 17¾; August, 17¾; September, 17⅞; October, 17¾ cents.

Metal Prices, November 11, 1912

NEW METALS.

	Price per lb. Cents.
COPPER—PIG AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lbs.	
Lake, carload lots	17.50
Electrolytic, carload lots	17.30
Casting, carload lots	17.25
TIN—Duty Free.	
Straits of Malacca, carload lots	50.25
LEAD—Duty Pig, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.75
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	7.50
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	33.00
100 lb. lots	30.00
Ton lots	28.00
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	10.50
Hallett's cask lots	9.75
Chinese	9.50
Hungarian grade	9.35
NICKEL—Duty Ingot, 6c. per lb. Sheet, strip and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots. Blocks according to quantity	40 to .45
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL—Duty 20 per cent.	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.50
BISMUTH—Duty free	2.00
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad valorem	.98
QUICKSILVER—Duty 7c. per lb	.58
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	45.50
SILVER.—Government Assay Bars—Duty free	64½

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
15.50 to 16.00	Heavy Cut Copper	16.75 to 17.00
15.00 to 15.25	Copper Wire	16.25 to 16.50
13.75 to 14.00	Light Copper	14.75 to 15.00
12.50 to 12.75	Heavy Mach. Comp.	14.00 to 14.50
9.25 to 9.50	Heavy Brass	10.50 to 10.75
7.50 to 7.75	Light Brass	8.75 to 9.00
9.00 to 9.25	No. 1 Yellow Brass Turnings	10.00 to 10.25
10.75 to 11.25	No. 1 Comp. Turnings	12.00 to 12.50
4.00 to ——	Heavy Lead	—— to 4.25
4.75 to ——	Zinc Scrap	—— to 5.25
10.00 to 12.00	Scrap Aluminum, turnings	13.00 to 15.00
15.00 to 19.00	Scrap Aluminum, cast, alloyed	18.00 to 22.00
20.00 to 22.00	Scrap Aluminum, sheet (new)	23.00 to 25.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.

		Price per lb. Cents.
Silicon Copper, 10%	according to quantity	27 to 32
Silicon Copper, 20%	" "	30 to 32
Silicon Copper, 30% guaranteed	" "	32 to 34
Phosphor Copper, guaranteed 10%	" "	25 to 28
Phosphor Copper, guaranteed 15%	" "	27 to 30
Manganese Copper, 25%	" "	27 to 30
Phosphor Tin, guaranteed 5%	" "	60 to 63
Phosphor Tin, no guarantee	" "	55 to 57
Brass Ingot, Yellow	" "	12 to 12⅞
Brass Ingot, Red	" "	14 to 16
Bronze Ingot	" "	15 to 15¾
Manganese Bronze	" "	19½ to 21
Phosphor Bronze	" "	13 to 16
Casting Aluminum Alloys	" "	25 to 30
PHOSPHORUS—Duty 18c. per lb. According to quantity		30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 23 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 60 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7½ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7½ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... Base Price.

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1⅝c. per lb.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	9 less 8%
Casks, jobbers' prices	9½
Open casks, jobbers' prices	10

Metal Prices, November 11, 1912

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect October 1, 1912, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.17⅜	$0.19¼	$0.20⅞
Wire	.17⅜	.19¼	.20⅞
Rod	.17⅛	.20	.21⅞
Brazed tubing	.22	—	.25⅝
Open seam tubing	.20⅞	—	.23⅝
Angles and channels, plain	.21¼	—	.24⅛

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.18⅝	$0.20½	$0.22⅛
Wire	.18⅝	.20½	.22⅛
Rod	.18⅜	.21¼	.23¼
Brazed tubing	.23¼	—	.26⅞
Open seam tubing	.22¼	—	.24⅞
Angles and channels, plain	.22½	—	.25⅜

Net extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

19c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	24c.	per lb. base
100 lbs. to 300 lbs. in one order	24½c.	" " "
Less than 100 lbs. in one order	26c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 22c. per lb.
Seamless Copper Tubing, 26c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	30	29	24	23	22	22	22	22	22	22	22	23	24	26	28	29

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1½ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 45 and 5%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red	19c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	17½c.	" "
" " " Rectangular sheets other than Sheathing	20c.	" "
" " " Rod	17½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 27⅝c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than..... 3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including..... 12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	43	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	150	174	..	..
" 38	..	124	130	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5/16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	37
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	.	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter, B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb.	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to No.	19,	B. & S.	Gauge,	inclusive	$0.60
6	"	"	19,	"	"	"	.70
9	"	"	19,	"	"	"	.85
12	"	"	19,	"	"	"	1.00
15	"	"	19,	"	"	"	1.15
16	"	"	19,	"	"	"	1.20
18	"	"	19,	"	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.